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ROMANIA WEST REGION COMPETITIVENESS ENHANCEMENT AND SMART SPECIALIZATION

Competitiveness of West Romania Firms:

Diagnostics, Challenges and Opportunities

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Intermediate Report

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Executive Summary

The West Region of Romania boasts a highly concentrated economic activity along several dimensions. A few sectors account for the bulk of employment, turnover and exports. Activity is concentrated within these sectors around a relatively small number of products, produced by a few large firms, most of which are foreign owned. Moreover, firms headquartered in the region tend not to have production facilities in other parts of Romania. The dominance of large firms sets Romania West apart from the rest of Europe and other regions in Romania. Finally, West Romania firms appear to specialize in basic manufacturing, while they underperform in skills and knowledge intensive activities.

With rising labor costs and considerable catch up still to be done before reaching EU averages of per-capita GDP, the region needs to identify strategies to achieve sustainable and inclusive growth. Enhancing the competitiveness of its firms is an important intermediate step towards durable growth. This report suggests three main ways to enhance the competitiveness of West Romania firms.

First, address distortions in market structure that may limit output growth potential.

The report finds evidence that output growth is positively correlated with a greater dispersion of firm size distribution which would reflect the existence of few leading firms and a wide range of smaller firms. In West Romania, small and medium enterprises (SMEs) are unusually under-represented in some sectors. This report determines that market structure in West Romania is relatively favorable to output growth in a set of industries which include: rubber and plastics; computer and electronic; electrical equipment; and other manufacturing. Borderline satisfactory market structures seem to be found in apparel; pharmaceutical products; glass; and machinery and equipment. In all other industries, the results indicate that there are too few SMEs, leading to a suboptimal output growth. These industries include food; textiles; leather products; wood products, pulp and paper; printing; chemicals; metal products; motor vehicles and other transport equipment; and furniture. The key policy suggestion deriving from these findings is that industrial policy should not target specifically small or large firms, but ought to try to coordinate initiatives that encourage the expansion of few big firms along with the development of a competitive fringe of SMEs.

Second, move to higher value added activities within traditional sectors.

In three of the most important sectors for the West Region - automotive, textiles, and agri-food the key decisions are taken outside the region. In the automotive industry the most important players are original equipment manufacturers and first tier suppliers, while in the food industry the main actors are primarily buyers (i.e. brands, retail chains, etc). Hence, upgrading in these sectors will require an enhanced capacity to meet strict requirements and specifications.

In the automotive sector, key conditions to upgrading are the creation of: a well-developed base of local suppliers, with capable management and able to produce high quality parts and components; a well-developed labor market, producing highly skilled but relatively

cheap technical experts; and a system of local R&D and innovation to develop prototypes or to produce customized parts and components. Achieving any of the above objectives seems a big challenge for the West Region, unless targeted public intervention is set in place.

In textiles, upgrading can be carried out through two main channels. The first possibility is to engage in process or product innovation via the creation of new machinery or chemical processes. The second possibility is to move upstream or downstream from assembly and other low value added activities, i.e. incorporating higher shares of services as input. Product or process innovation seems difficult for West Romania firms in the short term. All machinery is imported primarily from three countries (Germany, Italy and Japan) and there is no local expertise to reproduce or even modify such machines in order to adapt them to the specific needs of individual local firms. Hence the best way to upgrading for West Romania firms is to move upstream or downstream from central low value added activities and to build the skills and capacities for firms to start producing their own design or brand.

In the agri-food sector, improving the marketing of the local products and establishing linkages with large distribution chains appears to be the main challenge in the short term. However, global experience shows that those countries which managed to obtain the biggest value addition from their food production invested heavily in basic and applied research. Hence, upgrading in the agri-food sector should include financial and marketing support for the SMEs in the sector as well as initiatives to promote investment in applied R&D.

Third, create growth in knowledge-intensive sectors.

While identifying strategies to increase value added in traditional sectors is important, the economy must also expand in new knowledge intensive niche sectors. The needs of the private ICT sector in West Romania and experiences from countries that succeeded in creating areas of competitive strength in knowledge intensive sectors suggest a number of policy priorities. First, an innovation strategy that goes beyond promoting generation of high-tech. Bridging the gap between engineering and design, innovation in marketing, and financing strategies as well as in business strategies is equally important. Second, a large network of business incubators and accelerators offering a wide range of services, such as: working spaces; coaching services for new entrepreneurs; exposure to foreign experiences, and networking opportunities. Third, financing through venture capital is also recommended, as more rigid forms of financing are not amenable to the specific needs of new entrepreneurship.

1. Introduction

This report is designed to assess the overall competitiveness of West Romania Firms. It has three main objectives. First, it aims to provide a description of the West Region firms' competitiveness and benchmark it against other regions in Romania. Second, it wants to identify who are the drivers of performance in the West Region, in terms of firm types, sectors, sophisticated versus non-sophisticated production, etc. Third, it identifies policy measures to foster a sustainable growth pattern for the West Region.

The remainder of this report is structured as follows. Section 2 benchmarks performance in the West Region against performance in three peer regions in Romania: Bucharest-Ilfov, Centru and Nord-Vest. It does so against various parameters of firm performance: size and productivity differences, both in relative terms and in terms of distribution across firms, entrepreneurship, firm dynamism, and concentration of economic activity. Section 3 identifies the drivers of the region's performance. It finds that few exporters, mainly foreign owned, of large size and coming from the automotive sector drive the entire regional performance. Also, the firms from the region seem to specialize in basic manufacturing while they remain relatively reluctant to venture in new territory, even in those cases in which doing so would allow them to substantially increase their revenues. Section 4, discusses strategies for maximizing output growth and increasing value addition. Such strategies aim at ensuring a market structure that maximizes output growth, strategies to upgrade and increase value addition in traditional manufacturing sectors, and strategies to spur the emergence of competitive firms in new, knowledge intensive sectors. Finally, section 5 concludes.

2. Benchmarking West Romania Firms' Performance

The benchmark analysis of West Romania firms presented in this report draws essentially on *firm level data from the Structural Business Survey (SBS)*. The SBS dataset – provided by the National Institute of Statistics of Romania - encompasses complete financial information - at the headquarter level - for the 2005-2010 period, and includes all sectors, except agriculture and the banking sector. Annex 1 describes the dataset and presents the methodology used to define the final sample of firms to be analyzed.

2.1 Concentration

Economic activity in the West Region is concentrated in a handful of sectors that represent about half of the region's turnover and employment (Table 1)[1]. The top ten sectors in the West Region listed on Table 1 accounted for almost 54% of turnover and 55% of employment in 2010 and the concentration of the West Region economic activity around them has increased between 2008 and 2010.

Table 1. Main Economic Sectors in the West Region (% total)

	Turnover		Employment	
Nace 2-digit sector	**2008**	**2010**	**2008**	**2010**
Manufacture of motor vehicles, trailers and semi-trailers	9.0	22.4	10.1	17.0
Manufacture of wearing apparel	1.8	2.6	5.8	5.2
Wholesale trade, except of motor vehicles and motorcycles	16.9	9.2	5.3	4.9
Retail trade, except of motor vehicles and motorcycles	6.6	3.8	4.7	4.4
Manufacture of leather and related products	1.4	2.1	4.6	4.1
Manufacture of food products	3.7	4.8	3.7	4.1
Land transport and transport via pipelines	2.9	2.5	3.5	4.1
Mining of coal and lignite	1.0	0.6	4.2	3.9
Construction of buildings	5.5	2.6	5.4	3.7
Manufacture of computer, electronic and optical products	2.1	3.2	3.0	3.4
Top 10 Nace 2 digit sectors	51.0	53.8	50.3	54.7

Source: World Bank staff calculation based on SBS data.
Note: See Annex 1 for an exact description of the selected sample of (headquarter) firms used for this analysis.

[1] Sectors are defined as 2-digit groups according to the NACE Rev 2 classification.

The auto industry is by far the biggest employer in the region among manufacturing sectors with an importance in terms of total employment that is similar (17%) to the combined share of employment represented by all the other *manufacturing* sectors listed in Table 1 (16.8%). Among the services sectors, wholesale and retail trade dominate the landscape in terms of turnover (9.2% and 3.8% respectively) although transportation and construction are also relatively important in terms of employment (4.1% and 3.7% respectively).

Another key characteristic of West Romania firms is that they mainly restrict their operations to the region. They do not seem inclined to expand activities outside the region and to exploit comparative advantages of other parts of the country. Moreover, when they venture outside the region border, they start small in size. Table 2 and Table 3 present descriptive statistics about *plants* owned by *firms* headquartered in the region. In 2010, there were 4,059 *firms* with headquarters located in the West Region (see Annex 1). These firms owned a total of 4,587 *plants* almost entirely located in the region: only 252 plants were located in other regions (Table 2), and the majority of these plants located outside the Western borders (64.7%) belongs predominantly to small firms (0-9 full time employees) producing chemicals or carrying wholesale trade activities (Table 3). This evidence suggests that the productive landscape of the West Region is relatively self-sufficient, with no sign of linkages to other parts of Romania. This finding reflects evidence from the geographical, territorial and trade assessment provided in the companion reports.

Table 2. Plants Owned by Firms Headquartered In the West Region (2010)

Region	Freq.	Percent
North-East	24	0.52
South-East	27	0.59
South-Muntenia	22	0.48
South-West Oltenia	17	0.37
West	4,335	94.51
North-West	66	1.44
Center	63	1.37
Bucharest-Ilfov	33	0.72
Total	4,587	100

Source: World Bank staff calculation based on SBS data.
Note: See Annex 1 for an exact description of the selected sample of (headquarter) firms used for this analysis.

Table 3. Out of Region Plant Size of Firms Headquartered in the West Region (2010)

Size (# employees)	Plants	Percent
0-9	168	64.7
10-49	58	23.0
50-249	28	11.1
>=250	3	1.2

Total	252	100

Source: World Bank staff calculation based on SBS data.

2.2 Dominance of large firms

West Romania has less small business than other regions in Romania. Table 4 reports the share of firms in different size categories: less than 10 employees, 10-50 employees, 50-250, 250-1000 and more than 1000. The West region shows the second highest share of very big firms (more than 1000 employees), and the third highest of large ones (250-1000). In this region, 3.18% of the firms have more than 250 employees, against 3.41% in all Romania, 4.72% in Bucharest, 3.46% in the Center and only 2.75% in the North-West. And these large firms account for more than 62% of total turnover. Comparable figures for Romania as a whole and for Bucharest-Ilfov are 59% and 57%, respectively (Table 5).

Concentration towards large firms has increased in recent years. Between 2008 and 2010, the share of small business has increased less in West Romania than in most regions, while the share of large firms has increased more (or decreased less). This trend is even more important in terms of market shares. Small businesses suffered relatively more during the recent crisis in the West compared to the rest of the country.

Table 4. Number of Firms, And Shares by Size Categories in 2010 (with % change between 2008 and 2010 in parentheses)

		% of firms with				
Region	Nb. of firms	<10 employees	10 – 50 employees	50 - 250 employees	250 - 1000 employees	>1000 employees
All	41,852 *(-10.4)*	31.24 *(-0.5)*	48.42 *(-11.5)*	16.93 *(-20.6)*	2.82 *(-18.0)*	0.59 *(-15.4)*
Bucharest-Ilfov	9,894 *(-7.6)*	28.93 *(1.9)*	48.01 *(-9.1)*	18.34 *(-15.6)*	3.65 *(-12.4)*	1.07 *(-7.8)*
Center	5,382 *(-11.0)*	28.5 *(-1.6)*	49.46 *(-12.3)*	18.58 *(-18.9)*	3.07 *(-14.5)*	0.39 *(-22.2)*
North-East	4,439 *(-15.5)*	32.85 *(-3.7)*	48.79 *(-16.3)*	15.68 *(-29.4)*	2.41 *(-28.2)*	0.27 *(-14.3)*
North-West	5,604 *(9.6)*	29.5 *(-1.7)*	52.12 *(-8.4)*	15.63 *(-23.4)*	2.34 *(-18.6)*	0.41 *(-17.9)*
South-East	4,650 *(-12.3)*	32.95 *(-1.0)*	47.85 *(-13.9)*	16.39 *(-24.0)*	2.43 *(-20.4)*	0.39 *(-30.8)*
South-Muntenia	4,693 *(-8.6)*	32.39 *(1.2)*	47.75 *(-9.5)*	16.75 *(-19.5)*	2.66 *(-20.4)*	0.45 *(-19.2)*
South-West Oltenia	3,131 *(-9.7)*	37.88 *(0.5)*	45.23 *(-12.3)*	13.86 *(-20.9)*	2.43 *(-20.0)*	0.61 *(32.1)*
West	4,059 *(-11.2)*	32.72 *(-1.6)*	46.42 *(-13.5)*	17.69 *(-18.9)*	2.49 *(-21.7)*	0.69 *(-3.4)*

Source: Crozet et al (2013)

Table 5. Market Share by Categories of Firms In 2010 (with % change between 2008 and 2010 in parentheses)

Region	Firm with: <10 employees	10 – 50 employees	50 - 250 employees	250 - 1000 employees	>1000 employees
All	5.52 *(5.75)*	12.55 *(-2.2)*	22.19 *(-3.27)*	27.94 *(7.45)*	31.79 *(-3.65)*
Bucharest	4.38 *(-2.16)*	11.81 *(5.48)*	27.21 *(-0.86)*	38.24 *(-1.68)*	18.35 *(2.07)*
Center	5.2 *(-7.96)*	12.92 *(-12.4)*	29.09 *(0.07)*	28.31 *(-13.78)*	24.48 *(38.33)*
North-East	10.09 *(5.71)*	19.81 *(7.12)*	28.68 *(-1.01)*	28.78 *(-7.97)*	12.64 *(7.86)*
North-West	5.93 *(-7.53)*	13.29 *(-16.72)*	21.73 *(-19.13)*	21.93 *(9.17)*	37.12 *(21.03)*
South	4.24 *(15.6)*	9.7 *(-19.53)*	18.29 *(17.41)*	31.23 *(39.94)*	36.54 *(-21.23)*
South-East	6.61 *(47.88)*	13.68 *(26.33)*	15.13 *(8.38)*	17.16 *(21.99)*	47.42 *(-16.33)*
South-West	5.79 (18.36)	11.22 (23.72)	17.38 (-1.41)	21.28 (12.21)	44.33 (-10.35)
West	5.08 *(-11.19)*	12.11 *(-7.43)*	20.43 *(-22.98)*	29.6 *(30.44)*	32.79 *(2.49)*

Source: Crozet et al (2013)

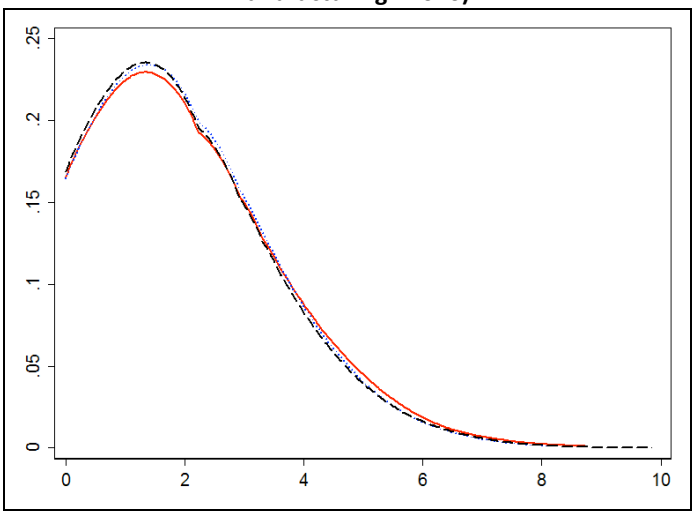
Given the importance of large firms, it is useful to compare the distribution of firm size in West Romania to the one in the rest of the country. Figure 1 shows the kernel densities of (the log of) manufacturing firm-level employment for all Romanian firms (i.e. the black dashed line) and the ones located in West Romania (i.e. the Red line).[2] For sake of comparison, it also shows the distribution for the firms in the neighboring North West region (Cluj). The difference between the Kernel density distribution in the West region and for Romania as a whole is visible.[3] In contrast, the distribution for the North West region is aligned to the one for the whole country. In the West Region, the distribution is shifted to the right which means that the probability to pick a larger firm is higher in this region than in the rest of the country. That is to say, the firms are larger on average in the West region, and that the distribution is "less skewed" than in the country as a whole.

To make sure that this evidence is not driven by composition effects, Figure 2 shows the same kernel densities for a range of key industries: Food; Apparel and Leather products; Computers and Electronics; and Motor vehicles. In all of them, with the exception of the food sector, the West region shows a very different firm-size distribution compared to Romania as a whole. The distribution is flatter, suggesting that the region has a relatively modest proportion

[2] Kernel density distributions provide the probability to pick a firm of a given size, given the overall population.
[3] Results are confirmed by the Kolmogorov-Smirnov test of equality of distributions.

of small firms. This relative lack of small firms implies that West Romania firms are larger on average, and that the distribution of firm size is less skewed.

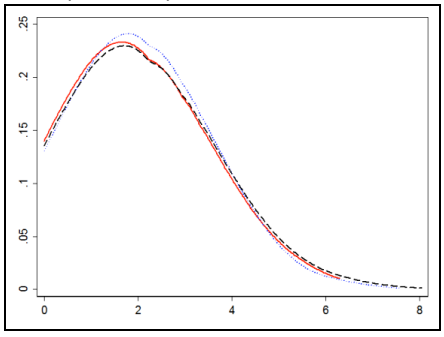
Figure 1. Distribution of Firm Size (Employment) in Romania, North-West And West Regions (all manufacturing - 2010)



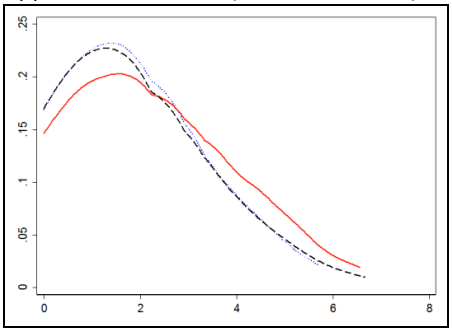
Source: Crozet et al. (2013)
Note: Dashed black line = All Romania / Dotted blue line = North West / Red line = West

Figure 2. Distribution of Firm Size (Employment) In Romania, North-West And West Regions in Four Industries (2010)

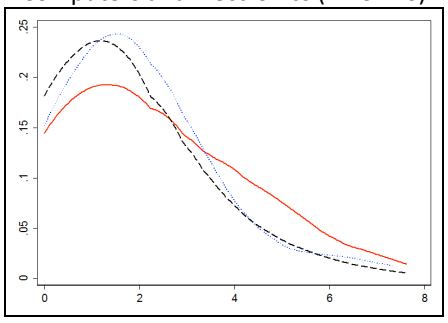
Food (NACE 10)



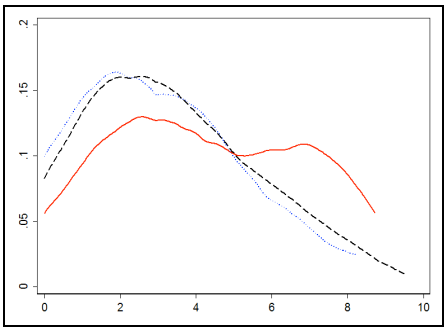
Apparel and Leather (NACE 14 and 15)



Computers and Electronics (NACE 26)



Motor Vehicles (NACE 29)



Source: Crozet et al. (2013)
Note: Dashed black line = All Romania / Dotted blue line = North West / Red line = West

This is confirmed by Table 6, which reports (for each region and all Romania) the Herfindal index of concentration, the standard deviation, the skewness of the distribution of firms, and average and median employment to characterize the distribution of firms' size (see Box 1 for details).

Box 1- Measures of firm size distribution

Various variables are used to describe the distribution of firm size within country-industry group. They are listed as follows: Herfindahl index, size of the average firm, size of the median firm, the standard deviation of employment and the skewness of employment.

The first is the Herfindahl index. It is defined as: $\text{Herfindahl}_{ikt} = \sum_a (\text{MkShare}_{a,ikt})^2$, where $\text{MkShare}_{a,ikt}$ denotes the market share of a given fim a in the country-industry-year group ikt. It ranges from 0 to 1. The closer to one, the more the industry is dominated by a large firm.[4]

We next use two alternative measures of the size of the industry: the size of the average firm, and the size of the median firm. The mean employment (MeanEmp_{ikt}) indicates the size of the average firm within an industry, while the median employment (MedianEmp_{ikt}) indicates the size of the firm that splits the firms' size distribution in half. It is worth noting that the main difference is that the median employment is not affected by the size of disproportionately large firms: it does not matter if the largest firm has 1000 or 5000 employees, as long as it is only one firm. The average employment however will be affected by extreme values. Both measures will become of particular interest once we control for the degree of dispersion in the distribution.

The fourth indicator of the firm-size distribution is the standard deviation of employment. The standard deviation is a measure of the average dispersion of a variable. A low standard deviation indicates that the distribution of employment in a given industry is centered on its mean, while a large standard deviation indicates the presence of both small and large firms in the industry. The standard deviation gives information on the dispersion of employment. To know if the distribution has more large firms than small firms we use an additional indicator: the skewness of the distribution (SkewnessEmp_{ikt}). This last indicator (the third moment of the distribution) indicates to which extent the heterogeneity in our distribution is mainly caused by large or small firms. A positive skewness indicates that the right-tail of the distribution of employment is longer

[4] For instance, if the industry is made of ten firms producing each on tenth of the industry output, the corresponding Herfindahl index is 0.1, or exactly the market share of each firm.

than the left tail. In our case, larges values of skewness indicate the presence of very large firms in the distribution. It is calculated as follow (in its normalized centered form): $\text{SkewnessEmp}_{ikt} = E(\frac{x-\mu}{\sigma})^3$ where μ and σ are the average and standard deviation of employment within each country-industry-year group respectively.

It appears that average firm size is, by a degree of magnitude, higher in the West region than anywhere in the country. Section 4 will show that while a larger average firm size may be considered an asset for the industrial performance of a location, the shape of the mean size distribution matters more than the average size of firms. In a typical industry, the best performing regions exhibit a higher dispersion of firms' size, and – even more importantly - a large skewness. And this is especially relevant in relatively less developed European countries.

In West Romania, the relatively large size of the average firm is not simply driven by a homothetic shift of the whole distribution of firms to the right, but much more by a distortion of the distribution to the right (a lower skewness). The average size is larger not because all firms are larger on average, but because the proportion of small firms is less important in the West than in the rest of the country. In clear, the West region has not enough small firms.

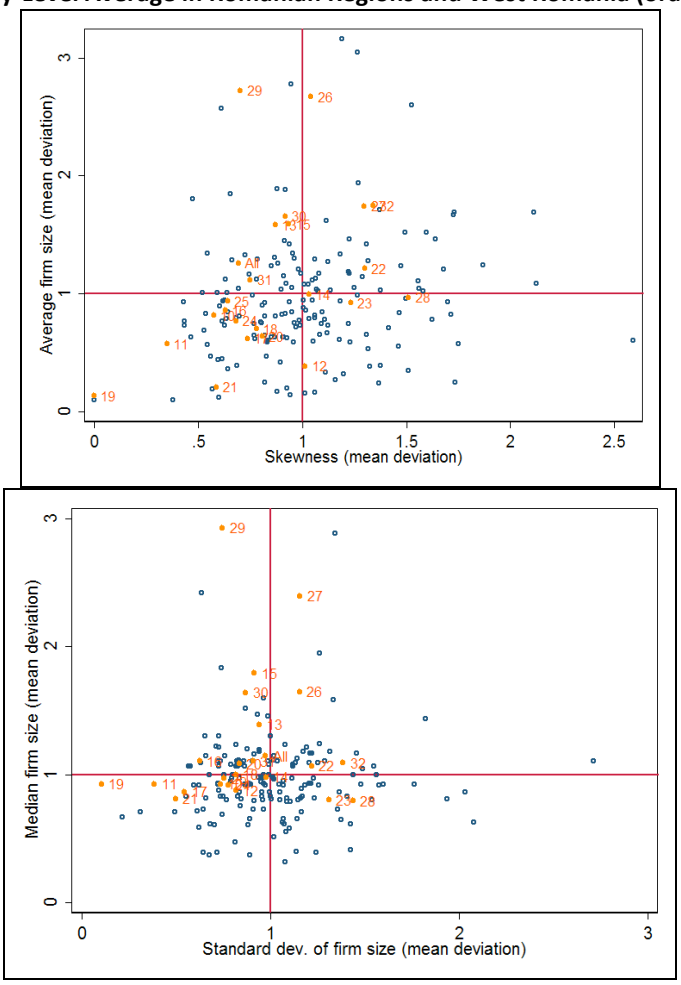
Table 6. Key Indicators of Firm-Size Distribution in Romanian Regions (All Manufacturing Sectors, 2010)

Region	Herfindahl	Standard Deviation	Skewness	Average Emp.	Median Emp.
All Romania	0.0056	6.6467	55.9551	24.0749	4
Bucharest	0.0121	9.7095	63.0536	26.2863	4
Center	0.011	4.0564	15.4313	24.4793	5
North-East	0.0065	3.8181	12.8502	18.6317	4
North-West	0.044	4.6532	18.3014	22.6573	5
South	0.0781	7.7385	46.17	26.8013	4
South-East	0.0686	7.2863	43.4817	20.3708	4
South-West	0.0351	5.983	17.5169	24.3675	4
West	0.0139	6.0003	20.5668	30.5118	5

Source: Crozet et al. (2013)

This is not exactly the case, however, in all industries. The first panel of Figure 3 plots the skewness against the average firm employment for region-industry group relative to the mean value of the corresponding indicator for each industry, across all Romania regions. The second panel plots the standard deviation of mean size against the median firm size. For both panels labeled orange dots identify data for the West region.

Figure 3. Mean Size, Median Size, Standard Deviation and Skewness for Each Industry and Region, relative to Industry-Level Average in Romanian Regions and West Romania (orange points) - 2010



Source: Crozet et al. (2013)

2.3 Productivity differences across regions

Often readers tend to associate firm size with productivity. The reasoning goes that productive firms grow in size, because they are more efficient. However, at the firm level there need not be a one-to-one association between firm size and productivity. If this were true, the West Region – which has a higher concentration of large firms – should be more productive than the rest of Romania. This is not the case however. West Romania total factor productivity (TFP) is in line with the one of the country as a whole and is outperformed by TFP in Bucharest-Ilfov (Figure 4 and Figure 5). The methodology used for estimating TFP is summarized in Box 2.

Figure 4. Total Factor Productivity Distribution By Region (2005-2007)

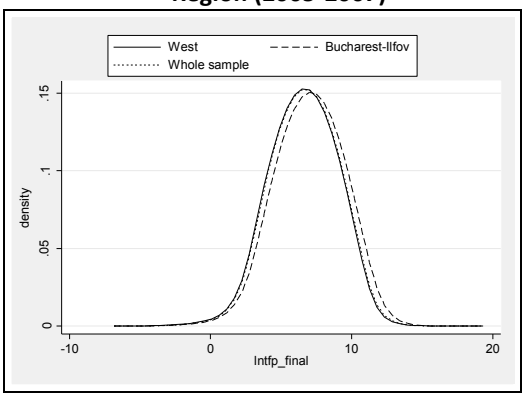
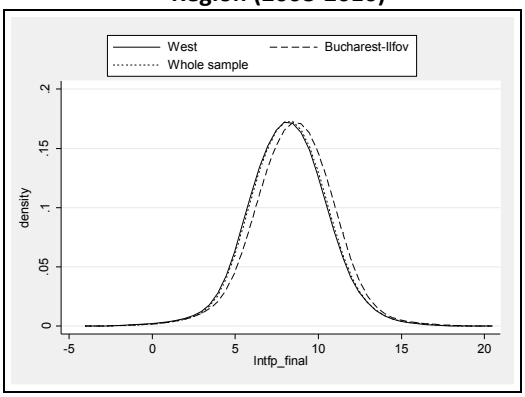


Figure 5. Total Factor Productivity Distribution By Region (2008-2010)



Source: World Bank staff calculation based on SBS data.
Note: See Annex 1 for an exact description of the selected sample of (headquarter) firms used for this analysis

Box 2. Estimations of Total Factor Productivity

Defined as the Solow residual of the production function, TFP is estimated using the methodology of Levinsohn and Petrin (2003). A production function with the following four variables was considered: output, labor, material inputs, and capital. Specifically, output is given by real value added at factor cost, labor is defined by (average) number of (full) time employees, material inputs is defined by real cost of raw materials and consumable materials plus other material expenditure, and capital is defined by real stock of tangible fixed assets. In order to control for differences in production technologies across sectors, the TFP analysis estimates heterogeneous sector-specific production functions. Two different panels were used: one for 2005-2007, based on NACE 1.1 (2 digit) classification; and another one for 2008-2010 period, based on NACE 2 (2 digit) classification.

There are significant differences between Bucharest-Ilfov and the rest of Romania, not only in terms of TFP but also along other performance parameters. Controlling for within (2 digit) industry differences in performance across regions and excluding state owned enterprises (SOEs), the benchmark exercise displayed in Figure 6 shows that Western firms in 2010 were, on average, less productive than firms from Bucharest-Ilfov region – 33.2% and 33.6% in terms of TFP and labor productivity respectively – and have higher unit labor cost. It is noteworthy however that these differences used to be higher in 2008, particularly regarding unit labor cost (Figure 7), which suggests that the West region has increased its competitiveness over the 2008-10 period – not only in terms of cost but also in terms of productivity – when comparing with Bucharest-Ilfov region

Figure 6. Differences in firm performance - excluding SOEs - in 2010 (% difference to Bucharest-Ilfov average)[5]

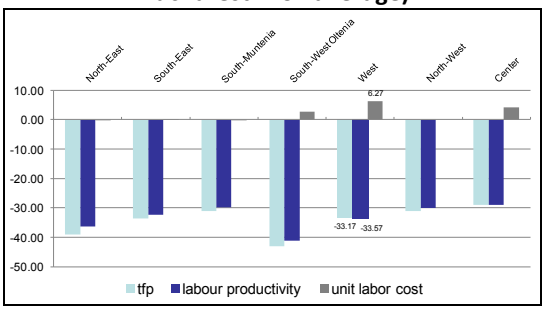
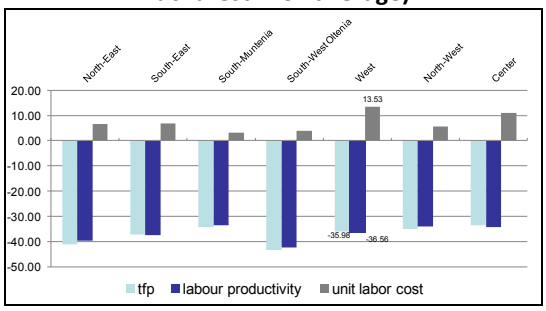


Figure 7. Differences in firm performance - excluding SOEs - in 2008 (% difference to Bucharest-Ilfov average)[6]



Source: World Bank staff calculation based on SBS data.

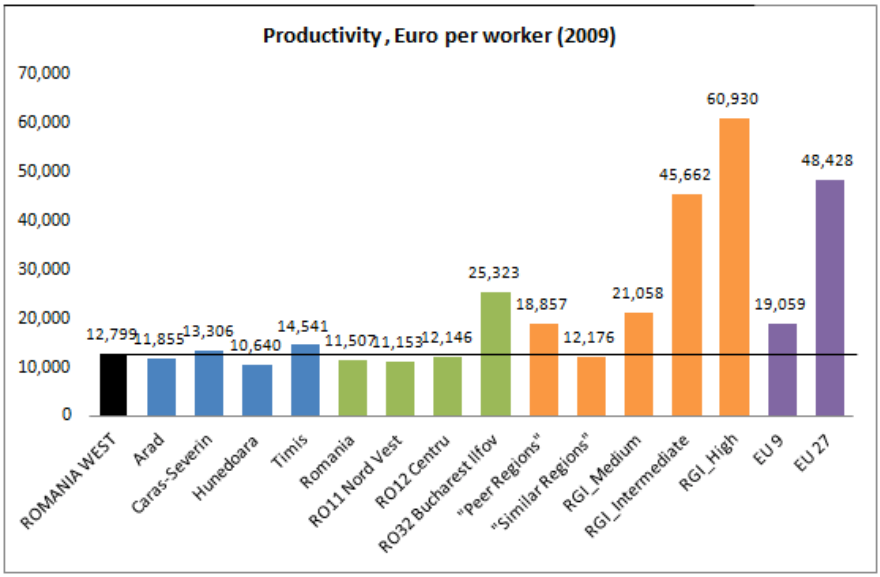
[5] The average percent difference of basic performance indicators (labor productivity, TFP and unit labor cost) across regions is estimated in a two-step procedure. First, an OLS model - for 2010 - of the log performance indicators (TFP, labor productivity and ULC) on region dummies and sector (2 digit) effects was estimated. Second, the region coefficients in the log-linear model are transformed according to (exp(beta)-1)*100. Annex 1 presents the exact definition of the performance indicators; nominal values were deflated with country or sector-level deflator to express values in 2000 Romanian Lei. Annex 2 displays the estimated coefficients.

[6] See note 6.

Note: See Annex 1 for an exact description of the selected sample of (headquarter) firms used for this analysis.

An international comparison suggests that productivity levels in the West Region are still low by European standards Figure 8. Although the average productivity in the West Region (€ 12,799) is slightly above the average for Romania (€ 11,507) it is significantly lower than the average for the newly admitted EU countries (€ 19,059) and the EU27 (€ 48,428).

Figure 8. Labor Productivity in 2009 (Current Euro per worker)[7]



Source: Eurostat.
Note: Labor productivity is defined as value added at (current) basic prices per employee.

2.3 Productivity distribution

While firms can be different in size and other characteristics, too much difference in productivity may be a symptom of inefficiencies. Hence, computing differences in firm productivity heterogeneity for different sectors can help to identify activities for which there is scope for efficiency improvements.

The skewness of firm productivity for the overall sample of Romanian firms and specific to individual regions is computed by using a two-step approach, as presented by Ottaviano et al. (2009). First, firm total factor productivity (TFP) is estimated relative to the sector specific TFP using the methodology described in Box 2.

Second, the skewness parameter of the above Pareto distribution of firms along the TFP dimension is estimated (see Box 3 for details on the estimation of Pareto distribution). The

[7] Eurostat productivity figures are not comparable with the remaining figures of labor productivity in this report which draw on SBS numbers for Romania. Figures based on sample of SBS firms (see Annex 1) are expressed in (constant 2000) Romanian values; use value added at factor cost , and time coverage is 2005-2010.

higher the skewness parameter, the higher is the dispersion in firm productivity. This in turn implies that there is a larger bias towards lower productivity firms, which suggests that there is large scope for adjustment through the selection and sorting of the most productive firms or through convergence of productivity levels. Figure 9 displays the ranking of sectors, by estimated skewness parameter for both the West Region and Romania. Only manufacturing sectors are included because computing TFP for services firms is a very controversial issue.

Three main results emerge. First, productivity disparities among firms vary significantly across sectors, but the ranking of such sectors is not correlated with the ranking of firm size distribution presented in Figure 3. Second, in most sectors, firm productivity dispersion in the West Region is lower than in Romania. Third, firm productivity dispersion is higher only for the following manufacturing activities: beverages, computer, electronic and optical products; electrical equipment; fabricated metal products (except machinery); and wearing apparel. Assuming that more productivity dispersion is associated with larger scope for productivity gains, evidence suggests that - compared to peer regions –there is less scope for efficiency gains in a number of industries in West Romania (Figure 10).

Figure 9. Potential for efficiency gains in NACE 2-digit sectors in Romania, 2010

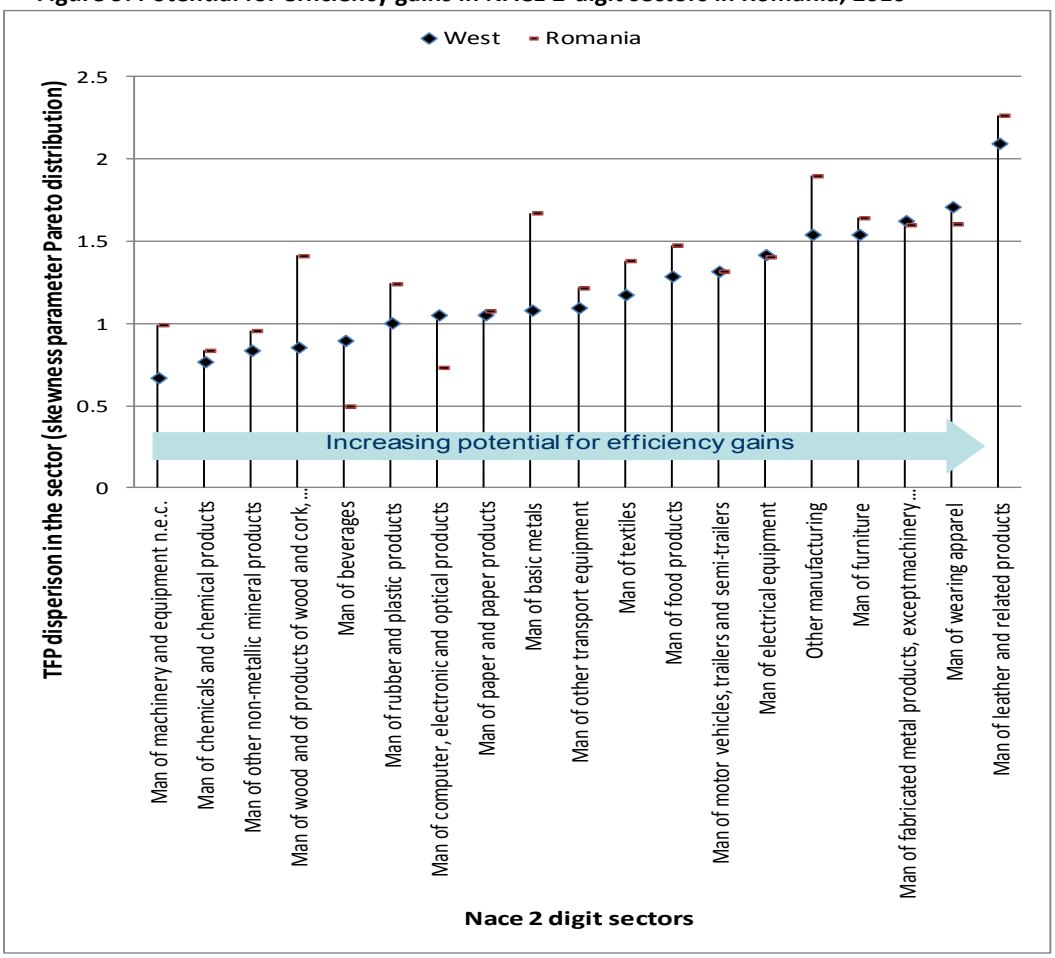
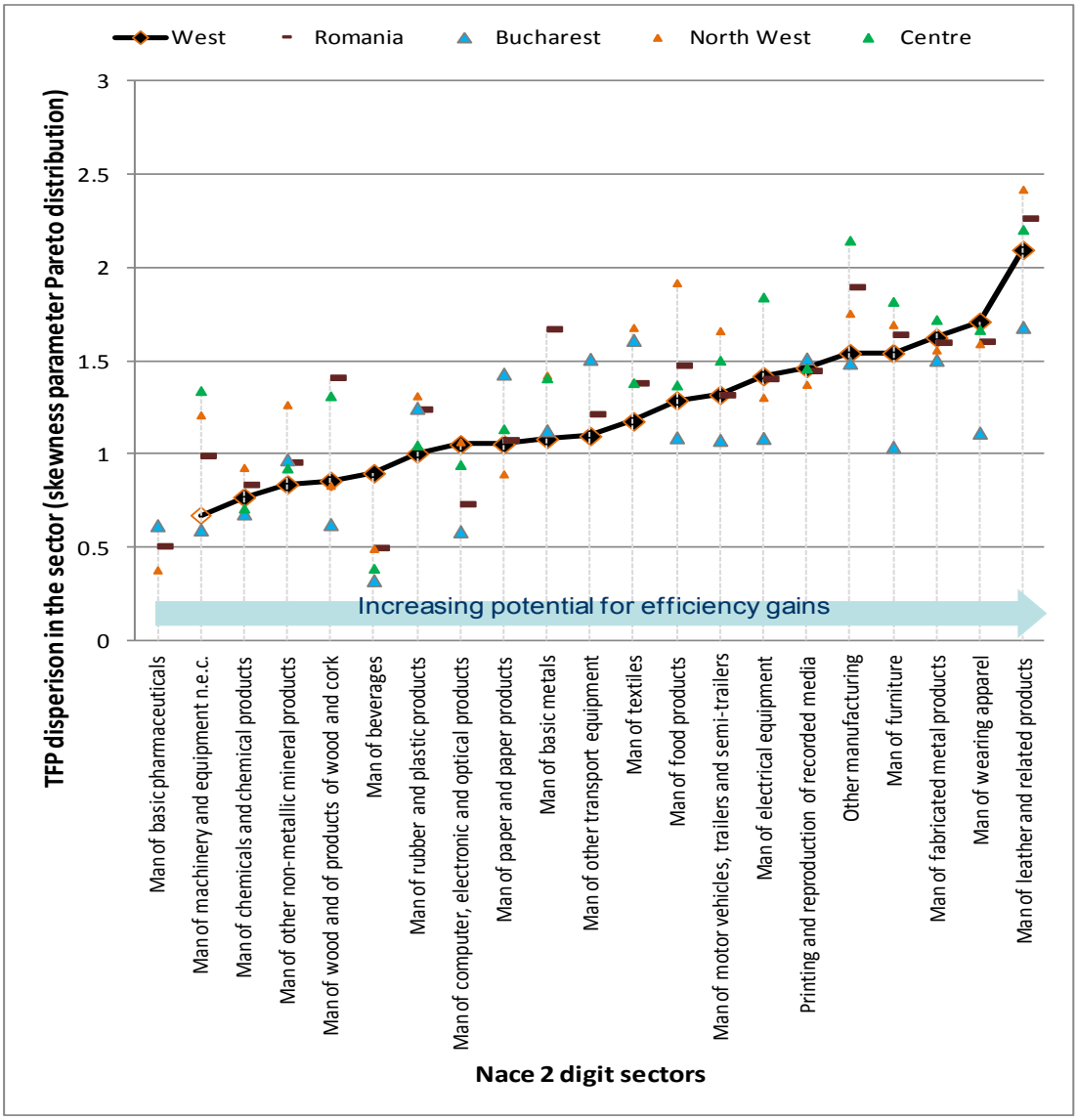


Figure 10. Potential for efficiency gains in NACE 2-digit sectors across regions in Romania, 2010



Box 3. Pareto Distribution

If marginal costs c in sector s and country h follow a Pareto distribution with possible outcomes ranging from 0 to cA,sh and shape parameter ks, it means that formally, the ex ante cumulative density function (i.e. the share of draws below a certain cost level c) and probability density function (i.e. the probability of drawing a certain cost level c) are given by:

$$G(c) = \left(\frac{c}{c_{A,s}^{\ h}} \right)^{k_s}, \ 0 \le c \le c_{A,s}^{\ h} \quad \text{and} \quad g(c) = \frac{k_s (c)^{k_s - 1}}{\left(c_{A,s}^{\ h} \right)^{k_s}}, \ 0 \le c \le c_{A,s}^{\ h}$$

, respectively.

On account of the law of large numbers, these are also the ex post cumulative density function and probability density function of entrants across marginal cost levels. A useful property of this Pareto distribution is that any truncation thereof also belongs to the Pareto family with the same shape parameter ks. This is due to the fact that, for any value of c, dlnG(c)/dln(c)= ks, i.e. a 1% increase in c leads to a ks% increase in G(c). In particular, since firms produce for the domestic market as long as their cost draws fall below cshh, the distribution of producers across marginal cost levels is characterised by the following cumulative and probability density functions:

$$G_s^h(c) = \left(\frac{c}{c_s^{\ hh}} \right)^{k_s}, \ 0 \le c \le c_s^{\ hh} \quad \text{and} \quad g_s^h(c) = \frac{k_s (c)^{k_s - 1}}{\left(c_s^{\ hh} \right)^{k_s}}, \ 0 \le c \le c_s^{\ hh}$$

.

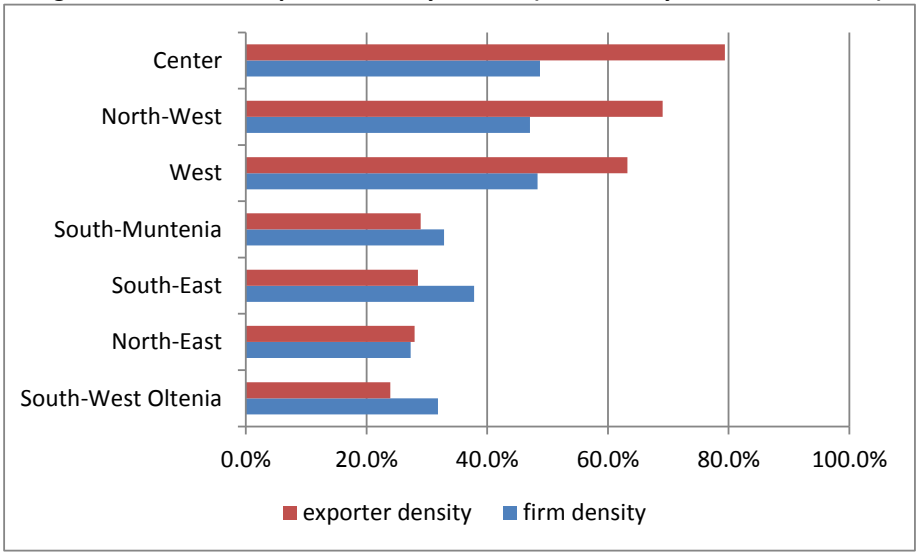
Is this anywhere close to what we observe in the data? This is easily testable, as stated above, under the Pareto assumption dlnG(c)/dln(c)= ks for any value of c. Then, if the marginal cost c were indeed distributed as Pareto, a simple regression of lnG(c) on ln(c) plus a constant would fit the data perfectly (R2=100%) and, by definition, the estimated coefficient of ln(c) would provide a consistent estimate of ks as the constant elasticity of lnG(c) to ln(c). The results of such regression, run by sector, give the skewness parameters of the Pareto distribution and are reported in the Figure 9 and Figure 10. The goodness of fit (R-squared) of this regression is very high, indicating that the Pareto distribution provides a very good description of the data. This has the additional useful practical implication that the average marginal cost in sector s and country h is equal to $c_s^{\ hh} k_s / (k_s + 1)$, which can be used to obtain a consistent estimate of the cut-off cost from sector-and-country specific averages.

2.4 Entrepreneurship

However, there are important signs of entrepreneurial activity in the West Region. It is one of the most firm and trade dense regions in Romania. In 2010, it ranked third in number of firms per capita with 211.5 firms per 100,000 inhabitants – ranking only behind Bucharest-Ilfov (437.5) and Center (213.2). In addition, with 639 exporting firms active in 2010, the West

Region had the third highest percentage of firms engaged in exporting in the country (15.7%)[8] and the fourth highest exporter density in Romania (33.3 exporters per 100,000 inhabitants). Yet, the gap compared to the leading region is still large. Figure 11 shows that exporter and firm density are less than seventy percent and fifty percent respectively of the density of exporter and firm density in the Bucharest-Ilfov region[9].

Figure 11. Firm and Exporter Density in 2010 (% of density in Bucharest-Ilfov)



Source: World Bank staff calculation based on SBS data
Note: See Annex 1 for an exact description of the selected sample of (headquarter) firms used for this analysis.

In absolute numbers however, exporting firms in Romania are mainly concentrated in Bucharest-Ilfov, Center and North Western regions. The West Region stands out as only the fourth main destination of exporting companies, accounting for 10.7% of exporting companies in the country (Table 7).

Table 7. Regional Distribution of Exporters and Non exporters

Region	Non Exp	Exp	Total
North-East	11.22	9.09	10.94
South-East	11.73	7.53	11.18
South-Muntenia	11.53	8.44	11.13
South-West Oltenia	7.82	4.93	7.45
West	**9.55**	**10.7**	**9.7**

[8] Numbers are computed based on a sample of (headquarter) firms from SBS dataset (See Annex 1). In 2010 the percentage of firms exporting per region were: Bucharest-Ilfov (12%), Center (19.6%), North-West (17.6%), West (15.7%), North-East (12.3%), South-Muntenia (10.6%), South-East (9.08%), and South-West Oltenia (9.04%).
[9] Bucharest-Ilfov is the leading region in terms of both firm and exporter *density* with 52.6 exporters and 437.5 firms per 100,000 inhabitants.

North-West	12.76	17.49	13.37
Center	11.87	19.62	12.88
Bucharest-Ilfov	23.52	22.2	23.35
Total	100	100	100

Source: World Bank staff calculation based on SBS data
Note: See Annex 1 for an exact description of the selected sample of (headquarter) firms used for this analysis.

"Gazelles", firms with at least a 25% turnover growth for 3 or more years, are of particular interest both because of their contribution to employment and as an additional indicator of entrepreneurship. In 2010, the last year for which firm level data from SBS dataset is available, gazelles in Romania were mostly concentrated in the Bucharest-Ilfov, Center and North-Western regions (Figure 12). The Western region is only the sixth main location for gazelles accounting for 10.5% of the gazelles in the country. However, in terms of percentage of gazelles over total number of firms, the Western Region presents the second highest probability of having a gazelle (4.5%), while the Center region shows the highest probability with 5.3% (Figure 13).

Figure 12. Distribution of Gazelles in Romania By Region – Excluding Soes (2010)

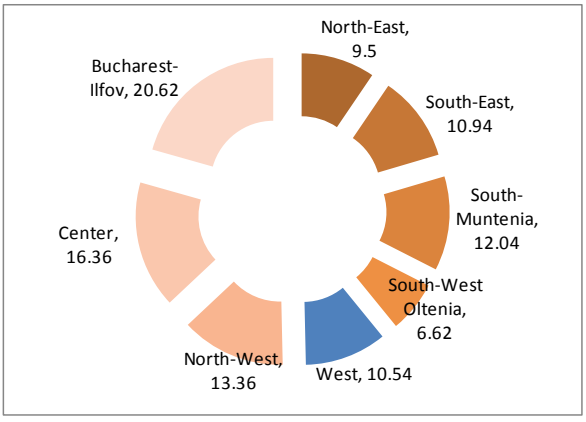
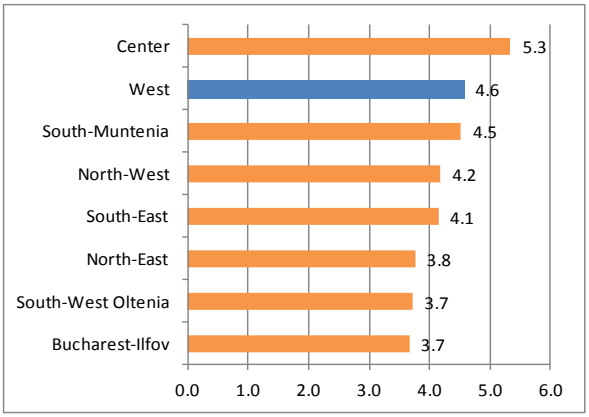


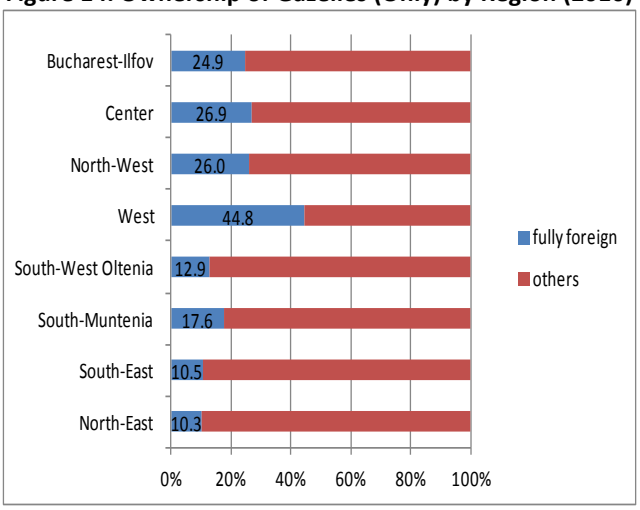
Figure 13. Share of Gazelles Among All Firms (Excluding SOEs), by region (2010)



Source: World Bank staff calculation based on SBS data
Note: See Annex 1 for an exact description of the selected sample of (headquarter) firms used for this analysis.

Another important characteristic of the gazelles in the West region is that almost half of them are foreign-owned (Figure 14). The fact that a significant number of these very dynamic firms are foreign-owned should not be surprising. This is coherent with analysis of exporting activity in the West Region as well as with the territorial and economic geography assessments (see the companion reports). Evidence against very different parameters indicates that foreign owned firms are the primary engine of growth and exports in the region.

Figure 14. Ownership of Gazelles (Only) by Region (2010)

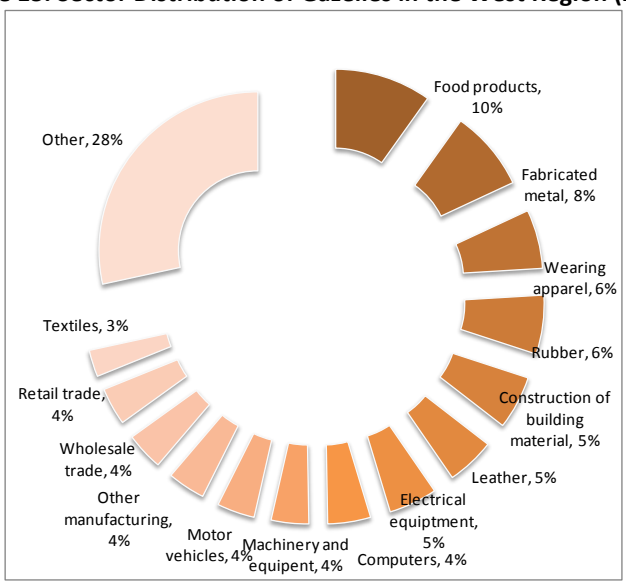


Source: World Bank staff calculation based on SBS data
Note: See Annex 1 for an exact description of the selected sample of (headquarter) firms used for this analysis.

Additionally, the sectoral specialization of the "gazelles" in the West Region is slightly different than the distribution of firms overall. While Western firms in general are mainly concentrated in service activities such as wholesale trade (14%), retail trade (10%), and construction of building material (5%), the gazelles are essentially specialized in manufacturing activities. Food products (10%); fabricated metal (8%), wearing apparel (6%), and manufacture of rubber (6%) are the sectors breeding the highest number of fast growing firms (see Figure 15).

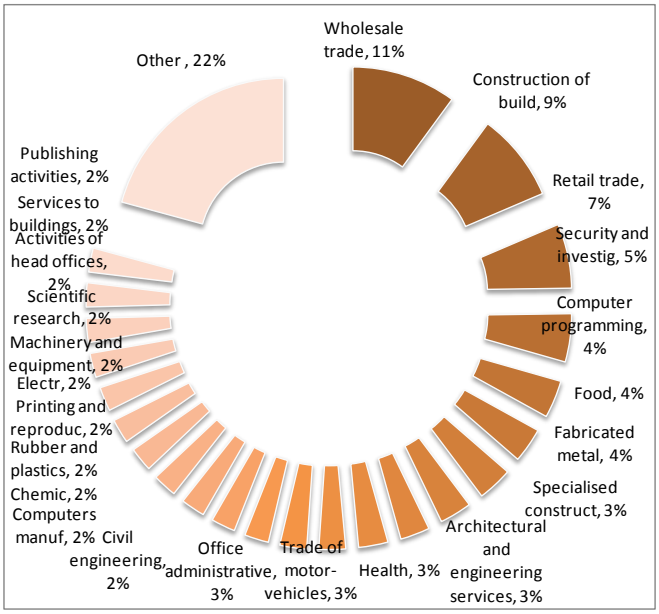
This trend is slightly different from the other regions where the sectoral specialization of the gazelles mirrors the sectoral concentration of firms in general. In the case of Bucharest-Ilfov, both gazelles and overall firms are essentially specialized in service activities (Figure 16). Another important difference between the West Region and Bucharest-Ilfov is that gazelles in the latter are spread out across several sectors, suggesting that economic growth in this region is likely to be more balanced, i.e. evenly spread among different parts of the economy.

Figure 15. Sector Distribution of Gazelles in the West Region (2010)



Source: World Bank staff calculation based on SBS data
Note: See Annex 1 for an exact description of the selected sample of (headquarter) firms used for this analysis.

Figure 16. Sector Distribution of Gazelles in Bucharest-Ilfov Region (2010)



Source: World Bank staff calculation based on SBS data
Note: See Annex 1 for an exact description of the selected sample of (headquarter) firms used for this analysis.

2.5 Contributions to productivity growth in Romania and in the West Region

The above differences between regions and between groups of firms within regions are quantified in terms of contributions to productivity growth. To do so, this subsection investigates the links between firm dynamics and productivity growth in Romania and in West Romania. The analysis is guided by the methodology by Geishecker et al. (2009) which uses a two-step approach and is summarized in Box 4. First, incumbent firms as well as market exiters and entrants are identified. Second, the contribution of each one of these groups – as well as of other firm categories – to aggregate domestic productivity growth is computed.

Based on the final sample of the SBS survey data – as defined by Annex 1 - four groups of firms are identified: surviving firms (S); new "start-ups" (NSU), new "big-entries" (NBE) and exit firms (X). Considering the first and latest year of data (2005 and 2010) available in the SBS dataset, we define as surviving firms those enterprises that are sampled in both years, while exiting firms are those sampled only in 2005.[10] NBE (new "big entry") firms are those with a date of incorporation antecedent to 2005, but that were sampled only in the conditional 2010 SBS round. Finally, the new start-up enterprises (NSU) are those whose date of incorporation is more recent than 2005 and that was sampled only in the conditional 2010 SBS round.

Box 4. Decomposition of TFP growth

Drawing on TFP estimation results at the firm level, computed as described in Box 2, the aggregate TFP growth in the 2005-2010 period is decomposed according to Equation 1, where $\pi_{i,t}$ denotes firm i's productivity at period t (2010) and $\theta_{i,t}$ is the share of plant i in industry employment, while t-k denotes the base period 2005. The first term on the right-hand side of Equation 1 denotes the overall growth contribution of surviving firms, while the second term represents the growth contribution of new market entries as "start-ups". Similarly, the third term denotes the contribution of market entries as "new bigs" while the last term represents the growth contribution of market exits.

Eq.(1): productivity growth decomposition

$$\Delta\Pi_t = \sum_{i\in S}(\theta_{i,t} \text{ x } \pi_{i,t} - \theta_{i,t-k} \text{ x } \pi_{i,t-k}) + \sum_{i\in NSU}(\theta_{i,t} \text{ x } \pi_{i,t}) + \sum_{i\in NBE}(\theta_{i,t-k} \text{ x } \pi_{i,t-k}) - \sum_{i\in X}(\theta_{i,t-k} \text{ x } \pi_{i,t-k})$$

This basic decomposition can be then extended to further distinguish between several criteria, as region, size, ownership, international exposure, etc.

Table 8 displays a summary of survival, exit and entry rates by region between 2005 and 2010. Romania presents a substantial demographic turnover, with an average exit rate of almost 24% in this period. In the West region, the exit rate is slightly lower, 22.97%, but still higher than the computed exit rate for the whole Euro area in the 2003-2006 period, 15.34%,

[10] The term exit is misleading as this firm not necessarily has ceased to exist in 2010.

according to Geishecker et al. (2009). On the other hand, the newcomer rates for the whole Romania– both among the "startups" (10.11%) and the "new bigs" (26.55%) – is substantially higher than the corresponding rates for the Euro area, as computed by the same authors- 0.43% and 1.58% respectively. Within Romania, the entry rates in the West region are showed to be slightly superior to the national averages.

Table 8. Exit and Entry Rates by Region

	Survival rate	"startups" newcomer rate	"New big" newcomer rate	Exit rate
North-East	41.39	9.3	25.2	24.11
South-East	41.48	9.25	26.41	22.86
South-Muntenia	41.48	11.07	25.86	21.6
South-West Oltenia	39.78	10.07	29.69	20.45
West	**40.38**	**10.11**	**26.55**	**22.97**
North-West	41.62	9.06	26.17	23.15
Center	44.76	8.12	25.32	21.8
Bucharest-Ilfov	37.28	10.69	23.98	28.06
Total (Romania)	40.65	9.78	25.69	23.89

Source: World Bank staff calculation based on SBS data
Note: See Annex 1 for an exact description of the selected sample of (headquarter) firms used for this analysis.

What is the overall contribution of each group of these firms to the aggregate TFP growth in Romania and West Romania? Figure 17 and Figure 18 shows the contributions for each of the terms in Equation 1 of Box 4 to productivity growth in the 2005-2010 period, for Romania as a whole and for the West Romania region, in particular. The largest positive productivity growth contribution comes from surviving firms in both cases, while the whole entry effect (entry of "new big" and "startups") accounts for the second higher portion. However, the contribution of startups, i.e. firms that were born after 2005 is almost 3 percentage points higher in West Romania than in the country as a whole. While the general proportion of contributions by group of firms is driven by the relative share of each group over the total of firms, some differences across regions surface (Figure 19). The "startups" group presents the highest contribution (10.4%) in the West region, while the "new big" entry share is the highest in the North West region. The market exit contribution is the highest in the Bucharest region, while in the West Region, as well as in the South-Western Oltenia, South Eastern and North Eastern regions the contribution to TFP growth by exiters is negative. This suggests that in these regions, consolidation of the market has already taken place. For West Romania, this confirms findings in Figure 9 and Figure 10.

Figure 17. TFP Growth Decomposition in Romania By Type Of Firm:2005-2010

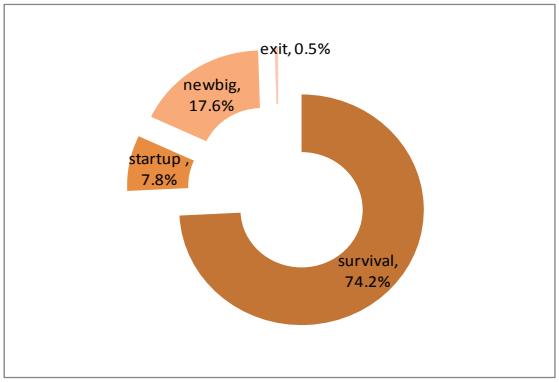
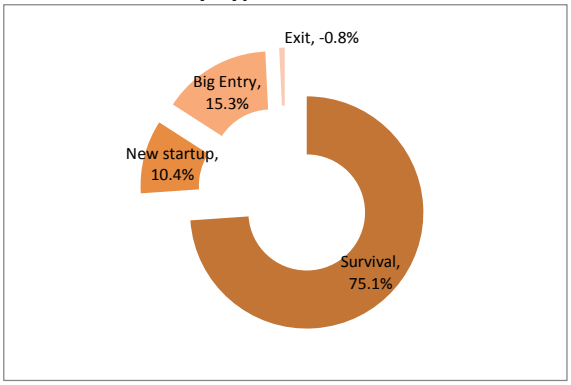
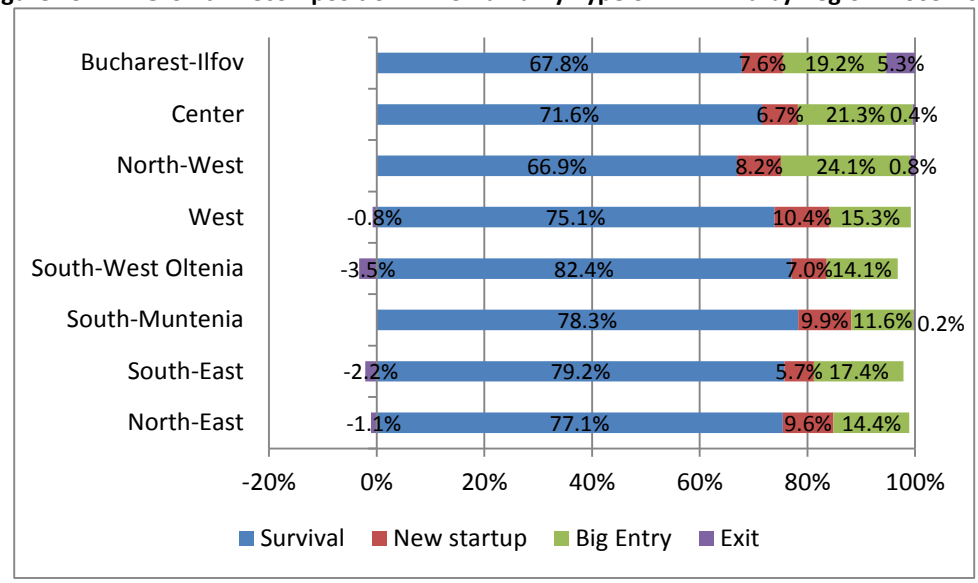


Figure 18. TFP Growth Decomposition in West Romania by Type of Firm: 2005-2010



Source: World Bank staff calculation based on SBS data
Note: See Annex 1 for an exact description of the selected sample of (headquarter) firms used for this analysis.

Figure 19. TFP Growth Decomposition in Romania By Type of Firm And by Region: 2005-2010



Source: World Bank staff calculation based on SBS data
Note: See Annex 1 for an exact description of the selected sample of (headquarter) firms used for this analysis.

Which region contributes most to the aggregate productivity growth in Romania in the 2005-10 period? The overall TFP growth in the country (2.49%) is mainly driven by Bucharest-Ilfov region; firms headquartered in this region account for almost 32% of the whole productivity expansion. The Center region is the second highest contributor, accounting for 12.2% of TFP growth in the period, while the Western region accounts for the third largest share, 10.3% (Figure 20). When excluding SOEs from the sample of firms the Western contribution to productivity growth is reduced to 9.8% (Figure 21).

Figure 20. TFP Growth Decomposition By Region:2005-2010

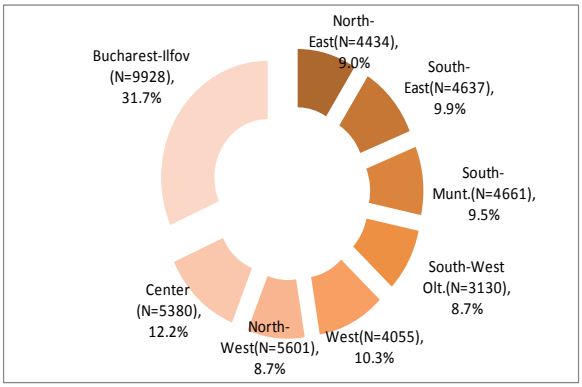
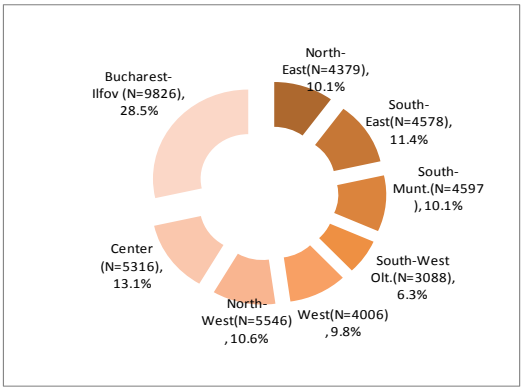


Figure 21. TFP Growth Decomposition (Excluding SOEs) by Region:2005-2010



Source: World Bank staff calculation based on SBS data
Note: See Annex 1 for an exact description of the selected sample of (headquarter) firms used for this analysis.

2.6 Summary

Economic activity in the West Region is concentrated in ten sectors that represent about half of the region's turnover, employment and wages and the concentration of economic activity has increased between 2008 and 2010. The auto industry is by far the biggest employer in the region among manufacturing sectors with an importance in terms of total employment that is similar (17%) to the combined share of employment represented by all the other manufacturing sectors in the top ten list (16.8%).

The firm landscape in the West Region is characterized by the domination of larger firms and is becoming more concentrated over time. The region has less small business than other regions in Romania and the average firms size is larger not because all firms are larger on average, but because the proportion of small firms is less important in the West than in the rest of the country.

Firms in the West region are less productive than in Bucharest-Ilfov, and although shrinking, these differences are still large. Western firms in 2010 were, on average, less productive than firms from Bucharest-Ilfov region – 33.2% and 33.4% in terms of TFP and labor productivity respectively – and have higher unit labor cost. These differences used to be higher in 2008, particularly regarding unit labor cost, which suggests that West region has increased its competitiveness vis-à-vis the leading region.

Western firms present less scope for efficiency gains in a number of industries compared to other regions. Productivity differences among firms vary significantly across sectors and regions. However, in most sectors, firm productivity dispersion in the West Region is lower than in Romania and relatively large only in some sectors. This more concentrated productivity levels indicate that, compared to peer regions, the opportunities for efficiency gains could be more localized to specific industries.

However, there are important signs of entrepreneurial activity in the West Region. In 2010, the West Region ranked third in number of firms per capita, the third highest percentage of firms engaged in exporting in the country (15.7%) and the fourth highest exporter density in Romania (33.3 exporters per 100,000 inhabitants). Additionally, the Western Region presents the second highest incidence of gazelles over total number of firms (4.5%) even though the sectoral specialization of gazelles does not follow the distribution of firms in the economy and seem concentrated in manufacturing sectors. This trend is slightly different from other regions as Bucharest-Ilfov, where the sectoral specialization of the gazelles mirrors the sectoral concentration of firms in general. Finally, the contribution of startups to productivity growth in West Romania is higher than the contribution of startups to productivity growth in Romania as a whole, by ten percentage points.

As a result West Romania accounts for 10.3% of total factor productivity growth in Romania. The overall TFP growth in the country (2.49%) is mainly driven by Bucharest-Ilfov region; firms headquartered in this region account for almost 32% of the whole productivity expansion. The Center region is the second highest contributor, accounting for 12.2% of TFP growth in the period, while the Western region accounts for the third largest share, 10.3%. When excluding SOEs from the sample of firms the Western contribution to productivity growth is reduced to 9.8%.

3. Who is Doing Well in the West Region?

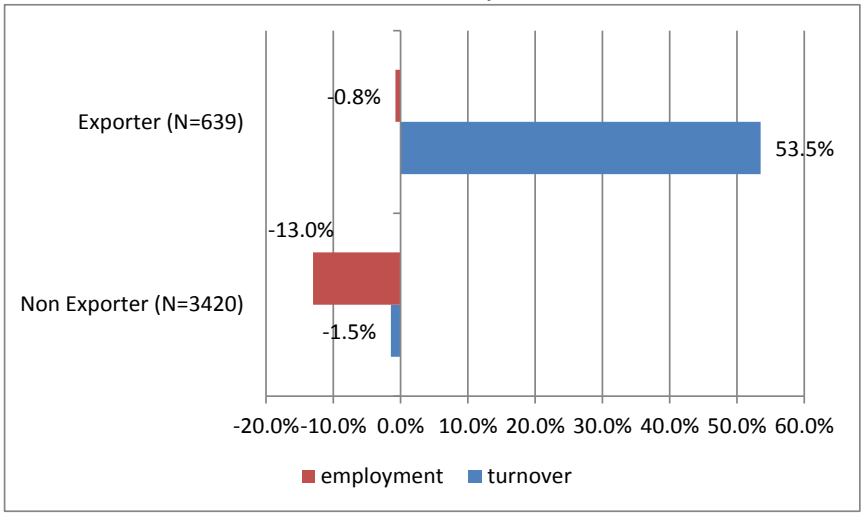
3.1 Dominant Firm Types: Big, Exporters and Foreign-Owned Firms, predominantly based in Timisoara and Arad are the over performers

The previous section described the firm landscape in the West Region and documented differences in productivity and entrepreneurship in comparison with other regions. This section provides a snapshot of the type of firms that are performing well in terms of employment and turnover in the West Region and the main differences in performance between sectors. Three types of firms are doing particularly well compared to the average in the region: exporters, foreign-owned, and large firms.

3.1.1 Exporters

Exporting firms in the West region posted an annual growth rate of 53.5% between 2008 and 2010, an impressive result taking into consideration that non-exporting firms registered a decline (-1.5%) during the same period. Similarly, exporting firms seem to have weathered the international crisis better than non-exporting firms as their total employment declined by only 0.8% compared with a 13% decline of employment for non-exporters.

Figure 22. Firm Comparative Performance by Export Status in the West Region (annual growth rate, 2008-2010)



Source: World Bank staff calculation based on SBS data
Note1: Annual growth rates are computed for aggregate values (of turnover and employment) for each firm category. Note2: See Annex 1 for an exact description of the selected sample of (headquarter) firms used for this analysis. Note3: number of firms (for each category) in 2010 in parenthesis

There are also huge productivity differentials between exporters and their counterparts which sell on the domestic market only. This however is not specific to the West Region of Romania. A large strand of the empirical literature shows that exporters are more

productive than non-exporters (see, for instance, Bernard and Jensen 1995, 1999, 2004a and 2004b) though it is not clear whether it is the firms' decision to export that makes them more productive or if more productive firms naturally become. Specifically two non-exclusive effects might take place. Exporters may be more productive simply because only more productive firms export (selection effect whereby firms start exporting in an effort to expand the market and helped by the ability to overcome the higher fixed costs of exporting), or because exporting raises productivity as firms learn new and better ways of doing things through their interactions with other foreign competitors, customers, and suppliers (the learning-by-exporting effect). This section however is not intended to explore the causality between productivity and export activities; it focuses only on the productivity differentials between exporters and non-exporters in West Romania and across other regions in Romania.

There are considerable disparities in TFP growth (over the 2008-10 period) between exporters and non-exporters in both the West Region and elsewhere in Romania (Table 9); the highest difference between exporters and non-exporters is indeed in South-West Oltenia. In the West region, exporting firms are on average 25.86 percentage points more productive than non-exporting companies.

Table 9. Average TFP Growth (2008-10) by Region (in p.p, weighted by employment)

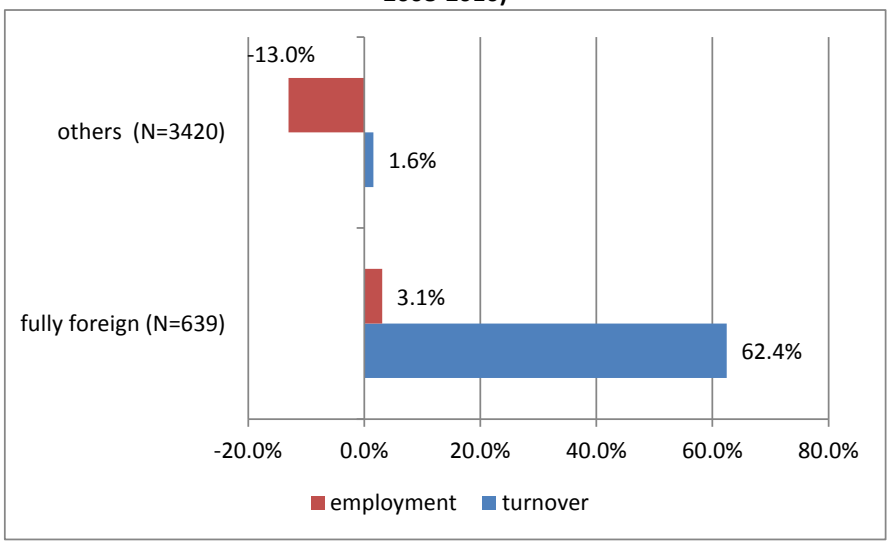
Region	Non exporter	Exporter	Diff (Exp – Non exp)
North-East	6.63	31.31	24.68
South-East	4.68	27.44	22.76
South-Muntenia	0.61	32.31	31.71
South-West Oltenia	0.58	33.61	33.04
West	8.51	34.37	25.86
North-West	4.69	33.00	28.31
Center	3.57	32.88	29.31
Bucharest-Ilfov	1.63	8.00	6.37

Source: World Bank staff calculation based on SBS data
Note: See Annex 1 for an exact description of the selected sample of (headquarter) firms used for this analysis.

3.1.2 Foreign owned firms

Foreign-owned firms experienced the most impressive performance among firms in the West region between 2008 and 2010. Despite the crisis, these firms grew in terms of both turnover (62.4% per year) and employment (3.1% per year). Domestic firms, by comparison, grew much less in turnover (1.6% annually) and declined in terms of employment (-13.0% per year) over the same period of time. The dominance of foreign owned firms is visible from their dominance of exports, discussed in the companion report "Trade Outcomes Assessment".

Figure 23. Firm Comparative Performance by Ownership in the West Region (annual growth rate, 2008-2010)

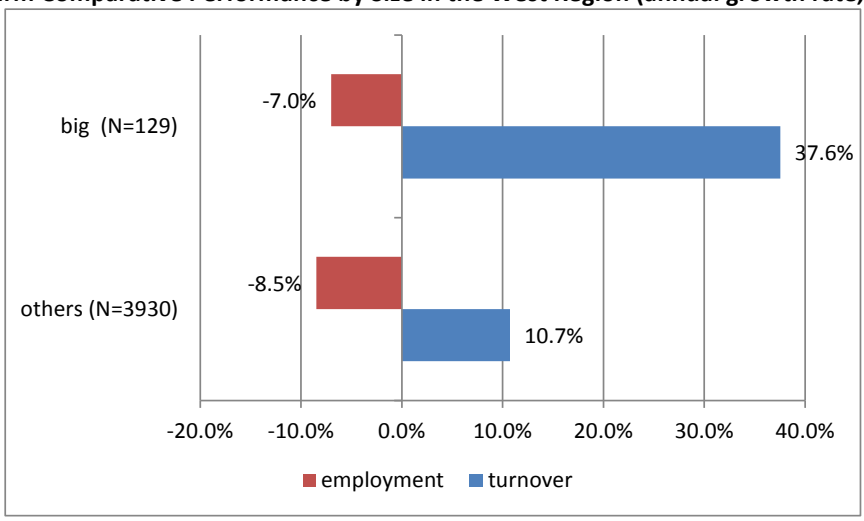


Source: World Bank staff calculation based on SBS data
Note1: Annual growth rates are computed for aggregate values (of turnover and employment) for each firm category. Note2: See Annex 1 for an exact description of the selected sample of (headquarter) firms used for this analysis. Note3: number of firms (for each category) in 2010 in parenthesis

3.1.4. Large firms

The third type of firms that are doing relatively well in the West Region are large firms (defined as firms with at least 250 employees). Between 2008 and 2010, large firms experienced a annual turnover growth of 37.6% despite an annual decline of 7% in employment. This compares with small and medium firms that experienced a larger decline in employment (-8.5% per year) and a smaller expansion in turnover (10.7% per year) over the same period.

Figure 24. Firm Comparative Performance by Size in the West Region (annual growth rate, 2008-2010)

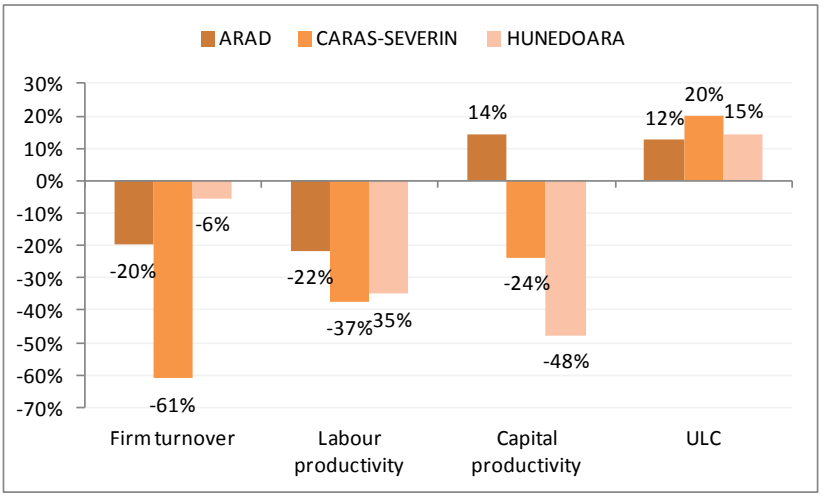


Source: World Bank staff calculation based on SBS data
Note1: Annual growth rates are computed for aggregate values (of turnover and employment) for each firm category.Note2: See Annex 1 for an exact description of the selected sample of (headquarter) firms used for this analysis. Note3: number of firms (for each category) in 2010 in parenthesis

3.1.5 Firms based in Timis and Arad

There is also a huge disparity across counties, which is discussed in detail in the companion report on the territorial analysis of the West Region. There is a strong spatial concentration of activity around Arad and Timis: almost 74% of exporting firms headquartered in the West region are located in these counties. In terms of performance, the leading county is Timis, except in terms of capital productivity, which is higher in Arad – possibly due to the concentration of automotive FDI in its territory. Specifically, the average firm in Arad has a turnover 20% lower than in Timis, labor productivity is 22% lower, and unit labor costs 12% higher. Capital productivity is 14% higher, however. In Caras-Severin and Hunedoara, labor and capital productivity are substantially lower (Figure 25). Importantly, the differences across counties are driven by both the non-exported and the exported sector (Table 10), suggesting that horizontal policies (with no discrimination between exporters and non-exporters) may be necessary to reduce the cross-county differences.

Figure 25. Benchmarking Performance Indicators Across Counties in the West region: average % difference to Timis (2005-2010)



Source: World Bank staff calculation based on SBS data

Note 1: Numbers reflect the percentage difference between the 2005-10 (employment weighted) average of performance indicators in Western counties in relation to Timis county. Sector differences are not considered.Note2: See Annex 1 for an exact description of the selected sample of (headquarter) firms used for this analysis.

Table 10 –Average TFP Growth (2008-10) in the West Region by County (in p.p, weighted by employment)

County	Non Exporter	Exporter	Diff (Exp-Non Exp)
Arad	8.97	48.64	39.67
Caras-Severin	12.91	19.28	6.37
Hunedoara	4.94	31.44	26.50
Timis	9.56	27.93	18.37

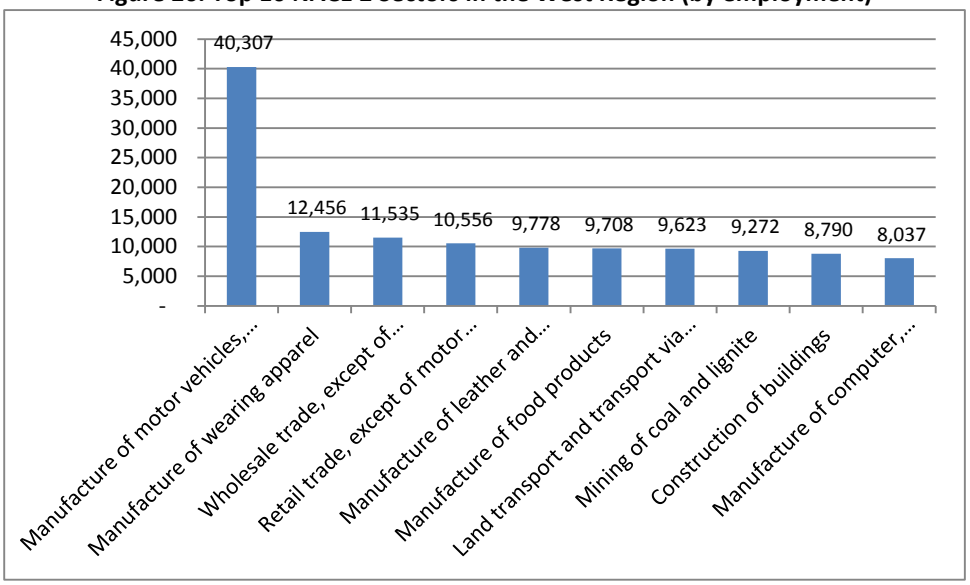
Source: World Bank staff calculation based on SBS data

Note: See Annex 1 for an exact description of the selected sample of (headquarter) firms used for this analysis.

3.2. Sectors: basic manufacturing over performs skill and knowledge intensive sectors

Export-oriented manufacturing sectors are the primary economic engines of growth in the West Region. Automotive is by far the largest employer (Figure 26) and alone accounted for the vast majority of output growth and employment in the region between 2008 and 2010 (see detailed discussion of sectorial engines of growth in the companion reports " Economic Geography Assessment: Territorial Development Challenges in the West Region" and "Territorial Assessment: Profile, Performance, and Drivers of Growth in the West Region"). Automotive turnover grew at annual rate of 13.1% in the auto sector while employment recorded a more modest 1.2% (annual) gain (Figure 27).

Figure 26. Top 10 NACE 2 Sectors in the West Region (by employment)



Source: World Bank staff calculation based on SBS data
Note: See Annex 1 for an exact description of the selected sample of (headquarter) firms used for this analysis.

Automotive is not only the dominant growth engine, but also the main export sector along with 'traditional' light industry (textiles and apparel); and electronics (ICT). By contrast, other sectors potentially strategic are very under-represented in terms of exports (Table 11). The performance of the West Region's main sectors (textiles, automotive and ICT) has been dissimilar over recent years. Broadly speaking, the sectorial specialization of the West region has been driven by 'production relocation'- first with apparel and footwear from Italy and then with automotive from Germany. Apparel and footwear was dominant up to the mid-2000s, to then decline in favor of automotive production, with its strong performance in terms of employment, turnover and export alike.

Table 11. Dominant Sectors by Exports (% shares)

Cluster sectors	2008	2009	2010
Textile	14.2	15.1	13.4
Auto	36.6	42.3	43.8
ICT	11.2	9.5	9.2
Construction	0.1	0.1	0.1
Agro/Food	0.4	0.5	0.5
Tourism	0.1	0.0	0.0
Energy	0.0	0.0	0.0
Health	0.0	0.0	0.0
Other	37.5	32.5	33

Source: World Bank staff calculation based on INS customs data

The exceptional performance of the automotive sector is not uniform. It masks important differences that exist between the "core" of the auto sector industry (mainly parts and components manufacturers linked to export markets) and firms in the auxiliary industries that serve primarily local markets. The former experienced double digit growth in terms of both turnover (20.5%) and employment (10.6%) while the auxiliary industries recorded a more modest growth of 3.5% in terms of output and a decline of 12.2% in terms of employment.

The textiles / footwear cluster registered a more modest uptake than the leading auto sector in terms of turnover and a decline in terms of employment. Again, the differences within the sector are significant. The textiles cluster experienced a sharp annual decline of 19% in terms of employment and a robust 12% annual increase in terms of turnover, while the footwear and apparel clusters recorded declines of 10.7% and 8.8% respectively in terms of employment and an increase of 3.8% and 6.3% in terms of output.

In general, between 2008 and 2010, the two most important manufacturing sectors in the West region experienced a non-negligible increase in turnover that was not accompanied by a corresponding increase in employment (except a modest increase in the auto sector).

Figure 27. Performance of the Auto Sector Cluster in the west Region (annual growth rate, 2008-2010)

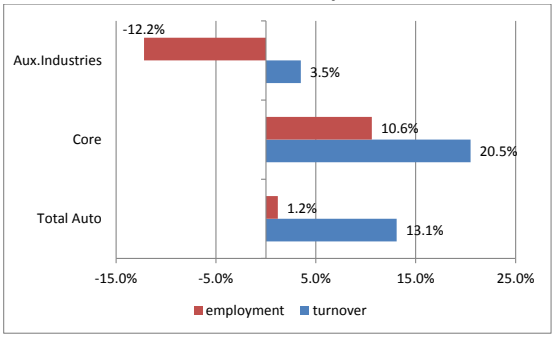
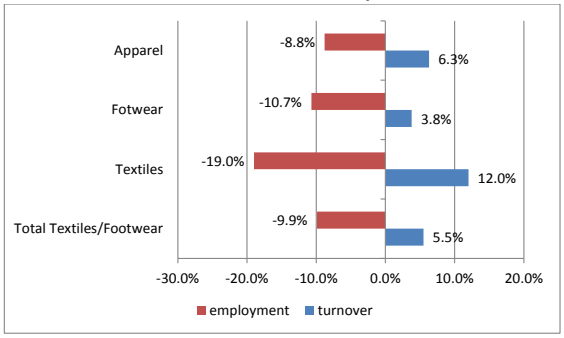


Figure 28. Performance of the Textiles/Footwear Sector Cluster in the West Region (annual growth rate, 2008-2010)

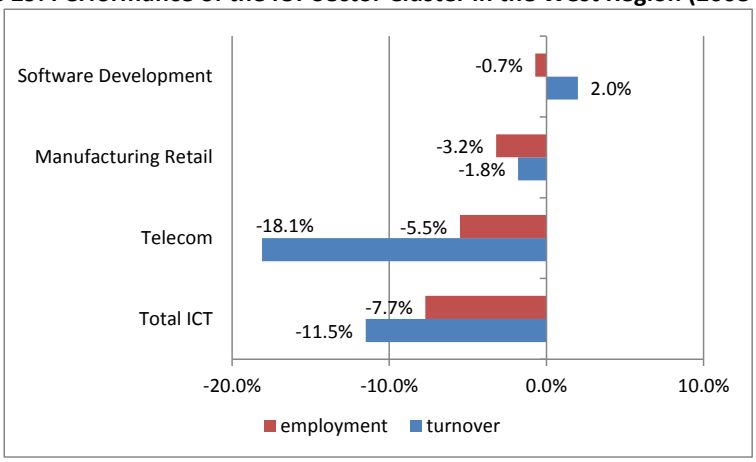


Source: World Bank staff calculation based on SBS data

Note1: Annual growth rates are computed for aggregate values (of turnover and employment) for each firm category.Note2: See Annex 1 for an exact description of the selected sample of (headquarter) firms used for this analysis and for a detailed definition of clusters.

The situation in the two manufacturing sectors described above contrast with the experience of the ICT sector, which represents a more sophisticated part of the economy. The ICT cluster as a whole declined in terms of both turnover (11.5%) and employment (7.7%) between 2008 and 2010 driven mainly by the sharp contraction of the telecommunications sector(-18.1% and -5.5% in terms of turnover and employment, respectively). It is worth noting that the only good performer in the sector was the software development cluster that registered a modest increase in turnover (2.%) and a minimal decline in employment (-0.7%).

Figure 29. Performance of the ICT Sector Cluster in the West Region (2008-2010)



Note1: Annual growth rates are computed for aggregate values (of turnover and employment) for each firm category.Note2: See Annex 1 for an exact description of the selected sample of (headquarter) firms used for this analysis and for a detailed definition of clusters.

3.3 Summary

Three types of firms are doing particularly well compared in the West Region: exporters, foreign-owned, and large firms. Exporting firms posted an average growth rate of 5% between 2008 and 2010, an impressive result taking into consideration that non-exporting firms registered a decline of about the same magnitude during the same period. Similarly, during the crisis the contraction of employment for exporters has been one third only of the contraction experienced by non-exporters. Underlying these differences there are huge productivity differentials between exporters and their counterparts which sell on the domestic market only. This however is not specific to the West Region of Romania. The performance of foreign-owned firms is even more exceptional. During the crisis, these firms grew in terms of both turnover (62% per year) and employment (3.1%), possibly benefitting of downsizing of activity in higher cost locations. Finally, categorizing firms by size, we find that large firms (defined as firms with at least 250 employees) also do well. Between 2008 and 2010, large firms experienced a turnover growth of 37.6% per year despite an annual decline of 7% in employment. This compares with small and medium firms that experienced a larger decline of employment and a smaller increase in turnover over the same period.

There is also a huge disparity across counties, which covers exporters and non-exporters alike. There is a strong spatial concentration of activity around Arad and Timis. In terms of performance, the leading county is Timis, except in terms of capital productivity, which is higher in Arad – possibly due to the concentration of automotive FDI in its territory. Cara-Severin and Hunedoara lag substantially behind Arad and Timisoara.

In terms of sectors, export-oriented manufacturing sectors are the primary economic engines of growth in the West Region. Automotive is by far the largest employer and alone accounted for the vast majority of output growth and employment in the region between 2008

and 2010. Automotive is not only the dominant growth engine, but also the main export sector along with 'traditional' light industry (textiles and apparel); and electronics (ICT). By contrast, other sectors potentially strategic are very under-represented in terms of exports.

Yet, within the dominant sectors not everybody is doing well. The exceptional performance of the automotive sector masks important differences between the "core" of the auto sector industry (mainly parts and components manufacturers linked to export markets) and firms in the auxiliary industries that serve primarily local markets. Similarly, differences are significant even within the textiles/footwear sector. The textiles cluster experienced a sharp decline in terms of employment and a robust increase in terms of turnover, while the footwear and apparel clusters recorded higher declines in terms of employment and smaller growth in output. Finally, in the ICT sector the only good performer was the software development cluster that registered a modest increase in turnover and a minimal decline in employment. Other segments declined sharply.

4. Challenges and Competitiveness Enhancing Policies

The performance of the West Region that emerges from the analysis above and from the companion reports suggests that there are reasons for optimism and reasons for concern. The West Region has experienced substantial productivity growth in the recent years, in particular in the automotive sector and even during the crisis. It can rely on a strong core of multi-product exporters very well integrated in European value chains. Moreover there are good signs of entrepreneurialism, with lot of experimentation in terms of creating and exporting new products and testing new markets. Yet, there are also reasons for concern. These are described in Section 4.1

4.1 Key challenges and concerns

The analysis in the previous sections has highlighted that the West Region is increasingly concentrated towards fewer products – mainly from the automotive sector - and fewer firms. Moreover, the firms from the West Region firms are also concentrated geographically: only 5% of the firms headquartered in the West Region have production facilities in other Romanian regions (see Section 2.1).

The sectorial, firm and geographical concentration may lead to high volatility of value added growth and sharp drop of per capita GDP during a crisis. By contrast, a diversified portfolio would dampen price fluctuations, as having more products, firms and/or production facilities in diverse geographical areas is likely to lead to independent price dynamics, with smoothening effects on total earnings. The more diversified and unrelated the region's production and exports, the less volatile its earnings would be. Put it differently, a more diversified portfolio of production would lead to a more stable stream of export revenues.

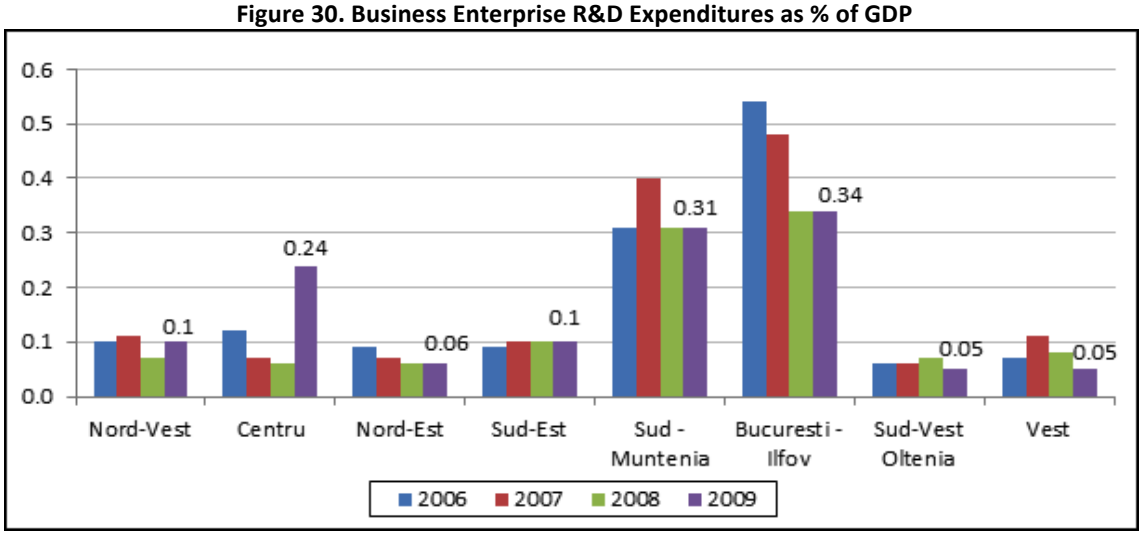
Not only production in the West Region is concentrated but the latter seems also to be skewed towards basic manufacturing (see Section 3.2). Competitiveness in skills and knowledge intensive sectors seem to be low. For example, the automotive sector in the West Region delivers wages that are 13% below the national average in the sector and the top export products are low or mid-tech (see companion report "Trade Outcomes Assessment"). In the agri-food sector, production has been outperforming processing in recent years while as much as 50% of production in the sector stems from low-tech activities such as processing and preserving of meat, production of cereals, legumes and oilseed and manufacture of bread. Moreover, according to focus groups, local producers do not always choose to use modern facilities; for example, a wholesale market space has recently been built in Timisoara, but this is used by Serbian producers more than by local Romanian producers. The latter seem to prefer local markets. Many local producers operate in a more rudimentary manner than Serbian firms, i.e. they do not make use of storage facilities, invest less in infrastructure, prefer selling on the grey market, etc. Finally, the ICT cluster remains relatively small within the

regional context and its performance relatively weak compared to other regions. Only 20% of the turnover in the region comes from ICT services.

The specialization towards basic manufacturing seems to be associated with low levels of investment in R&D and innovation. Eurostat data shows that total investments in R&D as a share of per capita income in the West region dropped from 0.3 percent in 2008 to 0.18 percent in 2009, which meant a return to the 2004 level of R&D activity. Over the same period, the EU-27 average for this metric has risen steadily to a stable 2 percent. The Regional Innovation Scoreboard for 2009 ranks all Romanian regions except Bucharest-Ilfov as low performers in innovation. The West region is no exception to this overall poor performance.

R&D spending of the private sector in particular is very low. Private firms in the West region spent around 0.05 percent of GDP on R&D in 2009, considerably less than the EU-27 average of 1.25 percent of GDP (Figure 30). Within Romania, this proportion places the West region in the lowest rank along with South West-Oltenia.

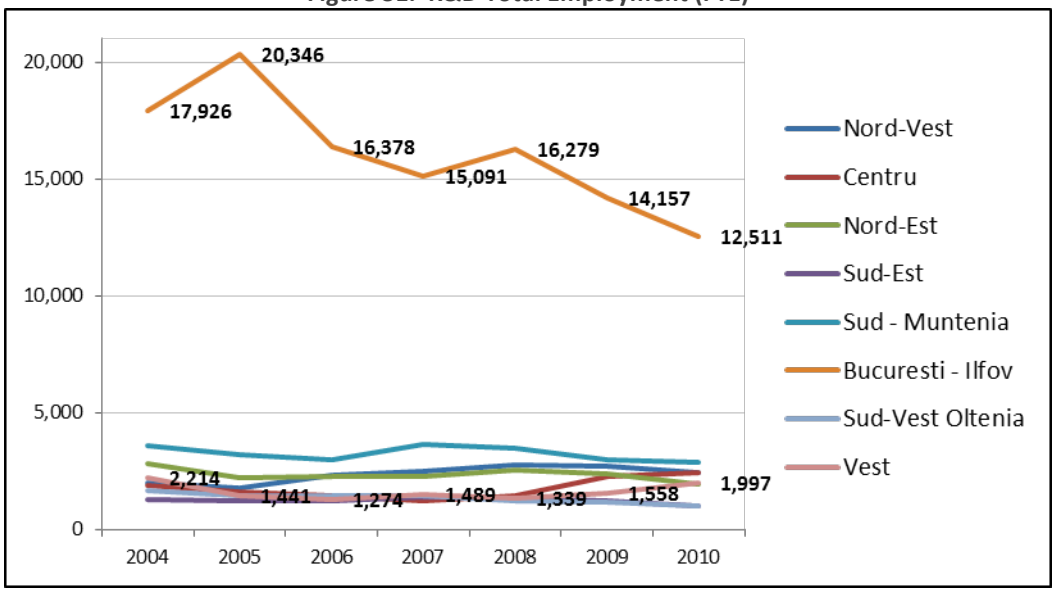
Figure 30. Business Enterprise R&D Expenditures as % of GDP



Source: Eurostat

Despite employment in high technology manufacturing seems high by Romanian standards, and the number of people working in high technology sectors in the West region has been steadily increasing since 2006, the number of R&D personnel (full time equivalents) in the West region is very low. In 2010 it was about 6 times lower than in the Bucharest-Illfov region and among the lowest when compared to other regions in Romania: West Romania had 1,997 employees in R&D in 2010, well below the 2004 level of 2,214 employees (Figure 31). Fortunately, since 2008, the number of R&D employees in the West region has been growing again. Meanwhile, in the Bucharest-Ilfov region – the leading Romanian region in terms of R&D personnel, it has been declining at a faster pace since 2005 (from 20,346 in 2005 to 12,511 in 2010).

Figure 31. R&D Total Employment (FTE)



Source: Eurostat

Overall, the picture of the West Region is a mixed one. Despite significant convergence with European Union averages, the gap with Europe remains substantial. The companion report ""Territorial Assessment: Profile, Performance, and Drivers of Growth in the West Region" shows indeed that per capita GDP (unadjusted for PPP) is at just one quarter of EU averages. Given this background, what are the main strategies to achieve sustainable, inclusive growth? In the remainder of the report three main areas for improvement are suggested. First, public policies should encourage at the same time the expansion of leading firms and the development of a competitive fringe of SMEs. These are important in several respects. They can be very dynamic, innovative and quickly create jobs. Moreover, larger firms tend to rely on smaller subcontractors to support their value chain. Finally, empirical research finds that small firms have a relative advantage in high-skill intensive, innovative industries (Acs and Audretsch, 1988). Second, we discuss concrete strategies to achieve higher value-addition in the large traditional sectors of the West Region, namely automotive, textiles and agri-food. Third, we discuss what it would take to build a strong competitive position outside in knowledge-intensive activities traditional sectors (especially business services and ICT sector).

4.2 Market Structure: The Importance of a Good Mix of Small and Large Sized Firms

The manufacturing sector is usually perceived as the main driver of productivity growth, employment and innovation. It is viewed as the leading sector for skilled workers, and governments have, at all times, promoted policies to boost their manufacturing firms. This is true in developed economies, as well as in developing or transition economies (Tybout, 2000).

Section 2 showed that an important characteristic of manufacturing in the West Romania region is a very concentrated market structure. In most industries West-Romania is

relatively well endowed in large firms, but less in smaller firms. This situation sets the region apart from the rest of Europe. Furthermore, the market concentration seems to have increased in the past few years: large firms have become larger over time, at the detriment of micro and small enterprises. While the average size of firms is larger, the skewness is lower, which means that the proportion of small firms is less important in this region. Is this shape of firm size favorable or unfavorable to growth of employment and output in the West Region?

Insights from the economic literature suggest that the degree of competition prevailing in a sector matter (see Box 5). Against this background an econometric analysis is performed in order to assess whether the unusual market concentration of the West region is an asset or a legacy for growth and employment.

Box 5. Market structure matters

Market structure is likely to have a bearing on industry growth, employment, and innovation. Focusing on innovation, some argue that a concentrated market structure may promote innovation in a more efficient way than would an industry made of myriad of small firms, others suggest that this may result in a static and inefficient allocation of resources. The theory of industrial organization usually predicts that innovation should decline with competition (Dixit and Stiglitz, 1977 and Grossman and Helpman, 1991). Meanwhile, empirical work shows the opposite (Geroski, 1995 and Nickel, 1996). Aghion et al. (2002) propose a theoretical model that involves an inverted U-shape between innovation and the degree of competition in an industry. Acs and Audretsch (1987, 1988) find that large firms have a relative innovation advantage in capital-intensive industries that produce differentiated goods. On the other hand, small firms have the relative advantage in high-skill intensive, innovative industries. Market structure has strong implications for economic growth, especially for transition economies where many pro-competitive reforms have been implemented. Using data on 25 transition economies, Aghion et al. (2002) find that for both old and new firms (firms born after the transition), competition pressure raises innovation, thus leading to higher economic growth. This literature feeds on the older and extensive literature on the relationship between the size and growth of firms (Gilbrat, 1931; Hart and Prais, 1956; Quandt, 1966; and Silberman, 1967).

And public policies can affect market structure. The “national champion” argument is based on the assumption that breeding a strong domestic player leads to great economic gains. This has led many countries throughout history to breed national champions in strategic industries. Nevertheless, some argue that policies that tend to favor large firms do so at the expenses of growth among smaller firms in the same sector (Little, 1987).

Besides policies that intentionally favor some domestic champions, there are also policies that while not being discriminatory de jure end up discriminating de facto. For example, firms may need certain credit requirement, or minimum size to apply to specific subsidies. Larger firms are usually seen as less risky by the banks, and could benefit from a preferential credit access compare to smaller firms. They are also more powerful in terms of lobbying and can influence policymakers in designing policies that are favorable to them. While we are not saying that all large firms benefit from preferential treatments and have strong powerful lobby, the presence of very large firms within an industry suggests that what is good for some firms may harm others.

How does the market structure influence the growth of output and employment in the manufacturing sectors, in general and in West Romania? Is competition a key factor in explaining the overall performance of manufacturing sectors? Is the presence of a "national champion" a good or bad thing for aggregate outcomes? Is the coexistence of a large firm with a large competitive fringe the good recipe for a dynamic manufacturing sector?

To answer these questions, to check their general validity, and the specific effect on West Romania, two different dataset are used: the first is the SBS while the second is the Amadeus database, provided by the Bureau van Dijk and covering a large sample of firms from several European countries[11]. The Amadeus dataset provides the country-sector variability that is needed in order to pin down the market structure associated with strong output and/or employment growth. The main objective of this analysis is not to determine the best distribution of firms for output and employment growth per se, but rather to identify the characteristics of firms' size distribution that make the industry most efficient. The empirical strategy applied described in Box 6.

Box 6. Empirical assessment and data

The approach used is fairly straightforward. It aims to reveal possible correlations between country and industry-level performances with some moments of the distribution of firms' size. The performances indicators are either the total turnover or the total employment in the country-industry group.

The following equation is estimated:

$$\ln(\text{Performance}_{ikt}) = \alpha \ln(\text{Distribution}_{ikt}) + \theta_{ik} + \varepsilon_{ikt}, \quad (1)$$

where subscripts i denote a given country, k a given nace2 industry and t a year, Performance_{ikt} is either the total turnover or the total employment in industry k, country i at time t, $\text{Distribution}_{ikt}$ is a variable characterizing the market structure in k and i at time t, and θ_{ik} are country-industry fixed effects.

Equation (1) is estimated using the first differences:

$$\Delta\ln(\text{Performance}_{ikt}) = \alpha\Delta \ln(\text{Distribution}_{ikt}) + \nu_{ikt}, \quad (2)$$

Various variables are used to describe the distribution of firm size within country-industry group: a Herfindahl index, size of the average firm, size of the median firm, the standard deviation of employment and the skewness of employment. These measures are described in Box 1.

Both simple univariate regressions and pooled bivariate regressions are applied to determine how these characteristics of market structure affect the growth of employment and the growth of output. We then complete this analysis by including interaction terms, and finally present some industry-by-industry results.

The detailed results on the impact of firm structure on employment and output growth are presented in the background paper by Crozet et al (2013) and reported in Annex 3 to this report. The main insights on output growth are summarized as follows.

[11] See Annex 3 for a detailed description of Amadeus dataset. Countries covered are: Belgium, Bosnia-Herzegovina, Bulgaria, Czech Republic, Switzerland, Germany, Denmark, Germany, Spain, Estonia, Finland, France, the United Kingdom, Greece, Hungary, Croatia, Italia, Lithuania, Latvia, Macedonia, the Netherlands, Poland, Portugal, Romania, Russia, Slovakia, Slovenia, Sweden and Ukraine.

4.2.1 Pooled results: what market structure for optimal growth in Europe and in Romania?

Estimates on the measure of size of our distribution (either by using the average or median size) are not robustly correlated with output growth (measured as total turnover). What seems to really matter for the growth of output is a more skewed firms' size distribution, associated with smaller firms on average (Table 12, column 2). A larger dispersion of firms is associated with stronger growth of output (column 4), and this effect gets stronger for smaller median firms.[12]

Table 13 replicates the bivariate regressions for Romania. Results are the very similar: the only difference is the non-significance of some interaction terms, which might be explained by the smaller sample size of Romanian firms, from SBS, when compared with overall Amadeus database. All in all, the regressions shown in Table 12 and Table 13 show that the dynamics of Romanian manufacturing sectors are very comparable to the ones observed in Europe as a whole. Industrial performance across Romanian regions is associated to a specific industrial organization which is very similar to the one governing industrial performance in Europe at wide. In a typical industry, regional and Europe-wide success is the result of a very strong heterogeneity and a skewed distribution of firms' size. In this sense, the optimal industrial organization seems to be coexistence of some big firms with a relatively large number of smaller ones.

Table 12. Change in Total Turnover and Market Structure: Europe-Wide Dataset (One Year Growth / Overlapping Periods)

Dependent variable: $\Delta \ln(Total\ Turnover_{ikt})$				
$\Delta \ln(MeanSize_{ikt})$	0.068c	0.099b		
	(0.04)	(0.05)		
$\Delta \ln(Skewness_{ikt})$	0.275a	0.249a		
	(0.03)	(0.03)		
Interaction term		-0.116b		
		(0.05)		
$\Delta \ln(MedianEmp_{ikt})$			-0.010	0.019
			(0.02)	(0.02)
$\Delta \ln(StDevEmp_{ikt})$			0.282a	0.277a
			(0.04)	(0.04)
Interaction term				-0.119b
				(0.05)
Nb. Obs.	4405	4405	4409	4409
R^2	0.158	0.167	0.132	0.138

[12] The negative sign of the interaction term indicates that for a given change in the dispersion of the firms' size distribution, output growth is higher when the median firm becomes relatively smaller. Results remain valid when controlled for the initial value of output (see Annex 3)

Source: Crozet et al (2013)
Note: OLS with country-industry and year fixed-effects. Robust standard errors are reported in parentheses.
Significance levels: a (p < 0,01), b (p < 0,05), c (p < 0.01).

Table 13. Change in Total Turnover and Market Structure: Romania Specific Dataset -SBS (one year growth / overlapping periods)

Dependent variable: $\Delta \ln(Total\ Turnover_{ikt})$				
$\Delta \ln(MeanSize_{ikt})$	0.756a	0.777a		
	(0.16)	(0.19)		
$\Delta \ln(Skewness_{ikt})$	0.253a	0.240a		
	(0.08)	(0.08)		
Interaction term		-0.113		
		(0.24)		
$\Delta \ln(MedianEmp_{ikt})$			0.140	0.010
			(0.23)	(0.15)
$\Delta \ln(StDevEmp_{ikt})$			0.787a	0.425c
			(0.22)	(0.23)
Interaction term				-2.045
				(1.30)
Nb. Obs.	360	360	367	367
R^2	0.334	0.335	0.146	0.217

Source: Crozet et al (2013)
Note: OLS with country-industry and year fixed-effects. Robust standard errors are reported in parentheses. Significance levels: a ($p < 0,01$), b ($p < 0,05$), c ($p < 0.01$).

4.2.2 Results by industry: when the combination of few large firms and many small players matters most

There is little reason to think every industry behaving in a similar manner. In this way, the sector level results are assessed (based on the European-wide dataset). In what follows results show that the combination of few large firms and many small firms is good for output growth in the following industries: beverages, metal products, food products, apparel, fishing, iron and steel, electrical equipment, computer and electronics, pulp, paper and paperboard, other transport equipment. By contrast sectors that do not require bit firms include printing, crop and animal production, wood products, forestry logging, and furniture.

This can be seen from Table 14, which reports the coefficients of mean size - Δln(MeanSizeikt)- and skewness of firm size distribution - Δln(Skewnessikt) -, and from Figure 32, which displays the results graphically (i.e. the t-statistics associated with each industry-level regression). The t-statistics themselves are meaningless, and the relative position of each industry should not be interpreted. They indicate simply if the estimated effect is significantly different from zero. It the t-statistic is greater than 1.96 in absolute terms, we can be confident at 95% that there is indeed an effect, and that we are not looking at a spurious correlation. The space between the two vertical lines indicates industries for which the coefficient on Δln(MeanSizeikt) is not statistically different from zero[13]. Similarly coefficients between the

[13] They show the interval [-1.96; 1.96] of the t-statistics inside which coefficients are declared statistically not different from zero at a 95% level of confidence.

two horizontal lines indicate industries for which the coefficient on Δln(Skewnessikt) is statistically non-significant.

Another way to read the results in Figure 32 is the following. Growth in the skewness of the firms' size distribution is strongly correlated with higher growth of output; the only exception being the tobacco and the pharmaceutical industries, with a negative and significant correlation. Focusing on the positive correlations, we do not find evidence of a composition effect between industries: the coefficients on the skewness range from 0.146 (textile industry) to 0.513 (other manufacturing industries).The relationship between growth in the average size and growth of turnover is not very robust. This is the case because in some industries the correlation is negative and significant (printing: -0.165, machinery and equipment: -0.139), while it is positive in others (beverage: 0.464, Computer and Electronics: 0.206), and insignificant in others (tobacco, textiles). To summarize, a larger dispersion in the distribution of firms is almost systematically correlated with a stronger growth of output, while a larger size of firms has mixed results: while in more than half the cases a larger average size is positively correlated with growth of turnover in the remaining cases is negatively correlated with it.

Table 14. Change in Total Turnover and Market Structure: Europe-Wide Dataset (Results by industry)

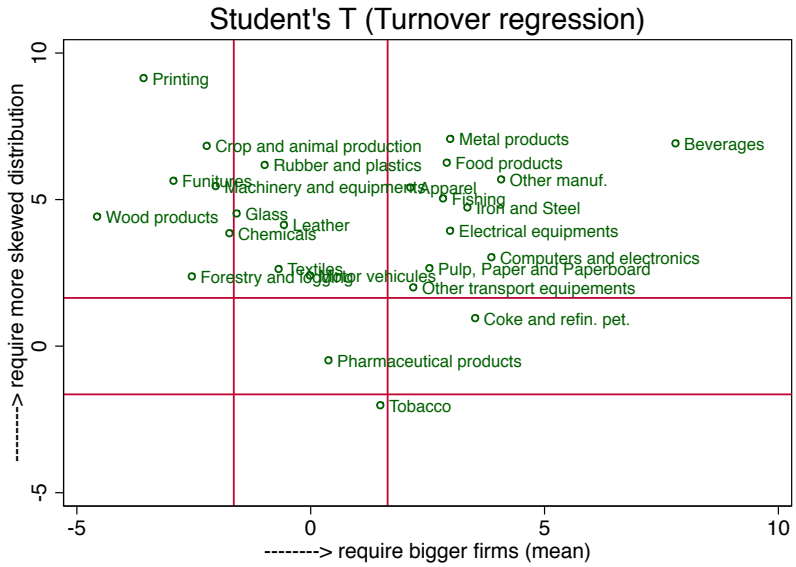
		Dependent variable: Total turnover	
Nace Code	Industry	Average size (employment)	Skewness (employment)
1	Crop and animal production	**-0.189**	**0.500**
2	Forestry and logging	**-0.182**	**0.244**
3	Fishing	**0.272**	**0.383**
10	Food products	**0.227**	**0.380**
11	Beverages	**0.464**	**0.416**
12	Tobacco	0.125	**-0.135**
13	Textiles	-0.045	**0.146**
14	Apparel	**0.181**	**0.481**
15	Leather	**-0.049**	**0.317**
16	Wood products	**-0.257**	**0.226**
17	Pulp, Paper and Paperboard	**0.167**	**0.175**
18	Printing	**-0.165**	**0.432**
19	Coke and refin. pet.	**0.529**	**0.232**
20	Chemicals	**-0.107**	**0.198**
21	Pharmaceutical products	0.028	**-0.042**
22	Rubber and plastics	-0.071	**0.312**
23	Glass	-0.088	**0.187**
24	Iron and Steel	**0.269**	**0.343**
25	Metal products	**0.300**	**0.482**
26	Computers and electronics	**0.206**	**0.260**
27	Electrical equipments	**0.189**	**0.270**
28	Machinery and equipments	**-0.139**	**0.322**
29	Motor vehicles	-0.002	**0.166**

30	Other transport equipments	**0.214**	**0.267**
31	Funitures	**-0.195**	**0.284**
32	Other manuf.	**0.275**	**0.513**

Source: Crozet et al (2013)

Note: The table reports the coefficients obtained from equation (1). Bold figures denote coefficients significantly different from zero at a significance level below 10%.

Figure 32. T-students / Level regressions (first difference) / Dep. Var. = Mean employment and Skewness



Source: Crozet et al (2013)

Mapping the above results to the market structure observed in West Romania (Table 6 and Figure 3) leads to the conclusion that market structure in West Romania is relatively favorable in a set of industries that include: rubber and plastics (22); computer and electronics (26); electrical equipment (27); and other manufacturing (32). Borderline satisfactory market structures seem to be found in apparel (14); pharmaceutical products (21); glass (23); and machinery and equipment (28). In all other industries, the results indicate that there are too few SMEs leading to a suboptimal output growth. These industries include food and beverages (10 and 11); textiles (13); leather products (15); wood products, pulp and paper (16); printing (18); chemicals (20); metal products (25); motor vehicles and other transport equipment (29); and furniture (31).

The policy implication for the West Region is therefore to identify and reinforce policies that support the specific emergence of new firms, in particular in the sectors in which the dominance of large firms seem to lead to suboptimal results in terms of output growth while keep encouraging growth and expansion of the leading firms.

4.3 What would it take to move to higher value added activities in traditional sectors?

4.3.1 Automotive

The automotive sector in the West Region has been faring very well, but important challenges may lie ahead. Having benefited of low labor costs, it may face a problem for growth in the medium term. With low unemployment in the two automotive poles of the region (Timis and Arad) wages are likely to increase and the local automotive industry may be confronted to more competition from other low-wage regions as well as from Serbia and Bulgaria. As a result growth will require the expansion to higher value-added activities and not purely labor intensive ones. If infrastructure (mainly roads and electricity) with the more backward counties of the region is improved, the region could develop a dual system, relocating more labor intensive activities outside Timis and Arad and developing higher value added activities in the latter.

High value added activities in the automotive are carried out in the pre- or post-production stages and low value added activities are carried out in the production and assembly phase. Typically, pre-production design and marketing activities take place in large developed countries while emerging and transition economies participate to value chains in the automotive sector by leveraging on low labor costs, proximity to large consumer markets and bilateral and regional agreements which facilitate the production process across borders.

Yet, changes are underway. The shift of consumer markets towards emerging countries and countries efforts to climb up the value chain led to some high value added content activities to move to lower income countries. For example the Renault-Dacia group, in 2007, has moved part of their regional design and development activities to Romania (see Box 7).

Box 7 - The Renault-Dacia regional design and development activities in Bucharest-Ilfov

In 2007 Renault-Dacia has moved part of their regional design and development activities to Romania (Bucharest). The center in Romania, the Renault Technologie Roumanie (RTR) is the largest Renault engineering center outside France, with approximately 2500 engineers. While the bulk of RTR activities are located in Romania itself, it also has entities in Slovenia, Russia, Turkey, and Morocco. Each of these additional locations employees few hundreds engineers and technicians. RTR mainly accommodates engineering functions (conception and testing), along with purchasing, design and support (management, human resources, IT). The main fields of activity are designing and improving vehicles and adapting engines and powertrains. With three locations in Romania, RTR brings together all the activities needed in the development on an automotive project. These include (1) engineering offices that develop and adapt vehicle projects to meet regional client's expectations; (2) a design studio; (3) a technical support center to the Dacia plant and to its suppliers; (4) a testing center that performs tests for the vehicles and the mechanical parts developed by the engineering studios.

The relocation of the design and development activities to Romania was driven by the Dacia small car, 'entry-level' model, and the idea that designing cars in an emerging market would

help address better the new consumer markets of East Europe and Asia. The centre now controls the development for all 'entry-level' vehicles (about 35% of all Renault vehicles worldwide).

Important determinants when choosing to relocate such activities are – according to Renault-Dacia, the business culture, low wages and an adapted institutional framework. Among the most important determinants in which government can play a role with well-designed funding and incentives are:

- A well-developed base of local suppliers, with capable management and able to produce high quality part and components.
- A good level of skills and an education system geared to technical knowledge is important.
- A well-developed local research system, in particular for development rather than pure research, is also important.
- Designing and forming deep regional and international agreements.
- Ensuring compatibility of the legal framework with 'Western' standards.
- Treatment of intellectual property rights.
- Building good infrastructure particularly road and rail transport.
- A friendly regime of fiscal incentives

Upgrading within automotive value chains require moving up a very hierarchical structure within integrated and mostly regional value chains. Large automotive manufacturers (OEM) are positioned on top of the pyramid as lead firms responsible for design, branding, and final assembly. The second level of the structure is constituted by first-tier suppliers that produce complete sub-systems by cooperating with a large network of lower (second and third) tier suppliers and subcontractors. Car assemblers and first tier suppliers tend to develop very close relationships, to ensure compliance with agreements, high standards of production and timely delivery of such complex parts and subsystems (Sturgeon and Florida, 2004).

The challenges the West region is confronted with in terms of upgrading to higher value added activities within the automotive sector are in various areas. Namely: widening the pool of labor and upgrading the skill offer; developing locally R&D and innovation activities so to help establish a cluster of sophisticated and value added activities in the region; and developing a wider base of local suppliers able to graduate to higher tier suppliers.

Labor markets and skills:

Interviews with the private sector in West Romania suggest that the local university system is relatively good but investment in vocational training and technical equipment for training purposes, as well as the development of technical knowledge programs are considered priorities. The main need seems to be access to a larger pool of specialized labor. Currently, companies in Timisoara – not only in the auto sector but also in ICT – are fighting for the same pool of graduates.

Firms have developed initiatives of on-the-job training with students and provide internships to help developing the skills the firm needs but the programs are small compared to the demand for new engineers.

R&D and innovation:

The scope for developing local R&D and innovation, beyond the current initiatives on energy efficiency and environmental-related projects seem limited. First, developing public-private partnerships aimed at R&D collaboration seem to be feasible only for the largest companies. Siemens and Continental have indeed many programs and partnerships with the local universities (e.g. sometimes engineers from the firm teach at the universities) but already Yazaki does not feel to have the necessary critical mass.

Second, the supply of sufficiently qualified researchers in local universities seems to be limited. Representatives from the automotive sector indicated Timisoara University as the only local university able to produce qualified researchers.

Finally, while there are ongoing efforts to align higher education curricula and training specializations with local economic activities, R&D activity in the automotive sector tends to be done outside the region, often in the headquarters of foreign owned companies (OEM and first-tier suppliers) or in collaboration with top universities worldwide. Even testing of prototypes is hard to do locally because local laboratories are scarce.

Stronger links between MNCs and local suppliers:

It is hard for local firms to develop into suppliers for the automotive value chains. First, in order to be accredited as official suppliers, firms need to satisfy quality requirements for all the firm's plants throughout Europe (should be able to service all plants and pass quality tests in all countries where this plants are located – Portugal, Czech Rep., Germany). Local suppliers need to reach global quality standards to be able to compete with others internationally because the firm can source from anywhere. Second, the ability of MNCs to choose suppliers of materials locally is limited even in those cases in which there could be an opportunity for local firms to supply custom-made equipment, service and repair. Such decisions are often made at headquarter level. Another main problem with local suppliers is that they are small. For this reason they cannot provide large enough volumes that a multinational corporation needs and may incur in problems of cash-flow, as payments by multinationals are done with a delay. Lastly, large foreign companies have the perception that, compared to other countries, former-employee spin-offs in the area of automotive are rare, further limiting the potential to develop a local supplier's base further.

4.3.2 Textiles

Textiles firms from West Romania did well during the crisis and in the recent period. They have sustained demand which have difficulty in meeting. The typical market positioning seems to be in niche products (e.g. very specialized cycling apparel) and other textiles for large foreign owned buyers. Moreover, some of the firms have developed own design capabilities, thereby showing signs of upgrading potential.

Upgrading in the textile industry requires following very well established patterns. The textiles industry is a buyer driven commodity chain marked by power asymmetries between

the suppliers and global buyers of final apparel products (Gereffi and Memedovic, 2003). After the phasing out of the Multifiber Agreement in 2005, it has become a very competitive industry due to the low barriers to entry and low appropriability of technology to the advantage of the companies that develop and sell brand-name products. These latter have considerable control over how, when and where manufacturing will take place, and how much profit accrues at each stage, essentially controlling how basic value-adding activities are distributed along the value chain.

Process and product innovation:

Unlike producer-driven chains, where value added and profits are generated through greater scale, volume and technological advances, in the buyer-driven apparel and textiles value chain, innovation comes either through new machinery that allows to develop new techniques or from the chemical industry. Interviews with focus groups suggest that upgrading through the development of new machinery and techniques is not within the reach of West Romania firms for the time being. All new technology used in local firms is made abroad, mainly in Germany, Italy and Japan. There is no local department for developing R&D able to implement modifications on the imported technology so to adapt it to the needs of the local companies. Upgrading through innovation in the chemical industry is also not feasible, as the chemical sector is not an area of strength in West Romania.

Moving upstream or downstream along the value chain towards activities intensive in service inputs, knowledge and value added:

Hence, if process and product upgrading through new machinery or innovations form the chemical industry are not feasible, the only other avenue towards upgrading in the textile and apparel sector is through an increasing integration of services and knowledge intensive tasks in the production process. Accordingly value added and profits will be greater in firms move to upstream or downstream segments of the textile and apparel process, i.e. if they do not focus on labor intensive activities at the center of the chain such as sewing, nesting, cutting, press and packaging.

This means that value addition will come from increasingly introducing high-value research, design, sales, marketing, and financial services. Broadly speaking, one can distinguish the following distinct value-adding activities within the textile sector itself. The activities at the top and at the bottom of the list are likely to contain more value added than the activities at the center of the list:

- R&D: This value-adding function includes companies that engage in R&D, as well as activities related to improving the physical product or process and market and consumer research.
- Design: This stage includes people and companies that offer aesthetic design services for products and components throughout the value chain. Design and style activities are used to attract attention, improve product performance, cut production costs, and give the product a strong competitive advantage in the target market.

- Purchasing/Sourcing (Inbound): This stage refers to the inbound processes involved in purchasing and transporting textile products. It includes physically transporting products, as well as managing or providing technology and equipment for supply chain coordination. Logistics can involve domestic or overseas coordination.
- Production/Assembly/Cut, Make, Trim (CMT): Textiles manufacturers prepare the fabric, using conventional and non-conventional textiles processing. Apparel manufacturers cut and sew woven or knitted fabric or knit apparel directly from yarn. The cut-and-sew classification includes a diverse range of establishments making full lines of ready-to-wear and custom apparel. Apparel manufacturers can be contractors, performing cutting or sewing operations on materials owned by others, or jobbers and tailors who manufacture custom garments for individual clients. Firms can purchase textiles from another establishment or make the textile components in-house.
- Distribution (Outbound): After apparel is manufactured, it is distributed and sold via a network of wholesalers, agents, logistics firms, and other companies responsible for value-adding activities outside of production.
- Marketing and Sales: This function includes all activities and companies associated with pricing, selling, and distributing a product, including activities such as branding or advertising. These companies frequently do not make any physical alternations to the product. Apparel is marketed and sold to consumers (via retail channels), institutions, or to the government.
- Services: This includes any type of activity a firm or industry provides to its suppliers, buyers, or employees, typically as a way to distinguish itself from competitors in the market (e.g., offering consulting about international apparel businesses or fashion trends, software to support any of the activities in the value chain, etc.).

A successful example for West Romania of upgrading to higher value added activities within the textile and apparel sector comes from Turkey (see **Box 8**).

Box 8- Examples of Own Design and Own Branding in Turkey

Turkish firms moved into the design segment of the value chain as part of a broader strategy to establish the country as a fashion center. Industry associations and government agencies collaborated to promote Istanbul as a leading fashion center, with the target for it to become the fifth global fashion center by 2023. Tight relationships of local manufactures with large global retailers such as M&S facilitated upgrading into design services. In 2007 Denizli was designing 10% of M&S garments manufactured in Turkey. Moreover firms such as Yavuz Tekstil developed their own designs. New regional opportunities stem from the Middle East and Africa, where Turkish designers target a growing demand for new products that combine heritage and modern fashion. Upgrading into own design manufacturing requires building a specialized and skilled workforce. This was done with government support. Organizations such as IKTB worked with the private sector and government agencies to establish fashion design vocational training schools. Istanbul Fashion Academy, established by a collaboration between the EU and IKTIC, trains students to the use of the latest technologies, fashion, design, product development, specialized photography, media, management, and marketing.

Upgrading into own branding, the next stage, after own design was supported by the Turkish government, which granted incentives for firms willing to upgrading into branding. These incentives include reimbursements up to 60% of the cost for a maximum of three years of personnel expenses, machinery, equipment, software, consultancy, and R&D related material. Leading local firms with own brands and retail outlets abroad include Sarar, Mithat and Bilsar. Erak clothing, originally a full-package supplier with international brands such as Calvin Klein, Guess and Esprit, is now successfully selling its own brand Mavi Jeans in 4,600 specialty stores in 28 countries worldwide. Developing own branding has required an additional effort in terms of fostering adequate workforce development. Organizations such as IKTIB offer short courses in marketing, sales, brand management, recruiting, selection strategies and value added production. KOSGEB provides marketing support to small and medium sized firms and offers training and consulting services for firms to build their capacity in the sector.
Source: Fernandez-Stark et al (2012)

4.3.3 Agri-food

The agri-food sector in West Romania contributes minimally to exports and relatively little to the region's output. Yet total employment across the cluster (see Annex 1 for a definition of the cluster) is just under 10,200 employees - accounting for around 4.3% of all employment in the region in 2010. The focus of the sector is on relatively low value added activities. Selling profitably, improving marketing, and establishing linkages with large distribution chains seem to be the main challenges in the short term.

Targeted initiatives for SMEs:

Being a sector characterized by a large presence of SMEs, it would benefit from targeted initiatives for small sized firms, e.g. in terms of supporting the development of infrastructure for improving quality, health and safety standards, SMEs financing initiatives, marketing initiatives such as the development of a regional brand, or training in marketing, sales, etc. specifically targeting SMEs.

Currently problems exist in all these areas. One main problem in becoming a supplier of large distribution chains seems to be the need to ensure quality and health standards that, according to focus group interviews, not always small firms are able to meet. And costs for complying with food and safety standards are high. There is only one accredited food safety and veterinary agency in Romania and it is located in Bucharest. Performing tests takes 10 days. With respect to SME financing, the needs are many. For example, financing may help local suppliers to access large retail chains. Some retailers require suppliers of food to co-finance shelve space in supermarkets, a costly activity that small firms may not have the financial resources to commit to. Finally public initiatives to offer short courses in marketing, sales, brand management and value added production may help. Marketing support to small and medium sized firms and training and consulting services for firms to build their capacity in the sector in particular could be very helpful in upgrading the West Region producers of food products.

Investment in basic and applied research:

The function of the food industry globally however suggests that investment in basic and applied research will also be necessary to increase competitiveness in the sector. The food industry, being a resource based sector, is characterized by low appropriability of resources. As such it is dominated by those countries that invest in basic and applied research (e.g. Switzerland, France, and the United States). Most innovation and value added is generated by suppliers through the creation of new machinery, new seeds, new chemicals and fertilizers, and more recently by the application of ICT to agriculture.

Given that food engineering, agriculture, and veterinary sciences are areas of strength of the West Region universities, public policy should encourage innovation in the agri-food sector. In this sense an encouraging initiative is the collaboration between the University of Banat and the private sector in the field of agriculture extension services, which was initiated with a contribution from the Word Bank MAKIS project funding in 2008.

4.4. What would it take to create growth in knowledge-intensive activities and services? The example of the ICT sector.

Employment in the software development sector has grown extensively in the last 10-15 years. In 1995, there were only 50 people working in software development but now that number has reached about 6,000. The sector grew even during the 2008-2009 crisis and it continues to do so at a sustained pace.

The comparative advantage of West Romania in the sector seems to come from low wages and good skills. Mathematics and computer science are areas of strength of the local universities. Some international firms have chosen Timisoara over other locations to exploit the local advantages in terms of skill availability and low wages while benefiting of locating within the EU. Dealing with EU customers, cultural affinities and time zone proximity are considered important advantages.

Despite the emphasis of the local educational system on computer sciences and mathematics, Cluj, which also has a strong technical university, is advantaged due to a larger share of the population that speaks German. This seems to be an important advantage for linking to German companies. In Timisoara, German speaking employees are hard to find as those who have good programming skills and speak German have already migrated.

Areas where the private sector sees scope for improvement are the following: enhancing the pool of skilled labor, which is in shortage in the region; creating a good environment for startups; developing business accelerators and adapting incubators to the needs of the ICT sector; increasing internet connectivity; helping firms connect with global customers; enhance linkages and interactions with downstream (user) sectors; improve the patenting policy.

Skills, labor, and wages:

While there is no immediate shortage of skilled labor, SMEs seem to have more difficult access to the skilled workforce they need. The main reason is that "customized" training is regarded as necessary in programming. While larger firms are connected to universities and fund laboratories so to train workforce to their needs, this is not possible for smaller firms.

Environment for start-ups:

Interviews with focus groups mentioned as a main constraint to the development of the sector the lack of financing for startups and small firms. This is necessary to pay for costs of initial investment and wages while allowing the time to develop a good application and/or software and generate revenue from it. For the type of business prevalent in the ICT sector, financing is best achieved through venture capital. The reason is that software companies need money upfront to experiment and other forms of financing (e.g. EU funds) may be too constraining.

Incubators and business accelerators:

While there is agreement on the usefulness of incubators and business accelerators, it was highlighted that to be useful these infrastructures also need to provide other services, such as information about the sector and the clients, assistance in drafting business plans, and financing possibilities.

Patents:

Romania's patenting framework is unanimously criticized by the private sector. As a consequence local companies prefer to seek patenting abroad, which however increases their costs.

Connectivity and infrastructure:

The ICT private operators indicated better internet connectivity and enhanced air-routes with Western Europe (in particular with Germany and Austria) as the main needs. By contrast, connectivity with Bucharest is not at all considered a need.

Links with global customers and with downstream user sectors:

Match-making mechanisms and more efforts to market the West Region ICT sector with downstream users and global customers also seem necessary. Replicating in Timisoara the more pro-active policies of Cluj is suggested.

Box 9 - Succeeding in new knowledge intensive, niche sectors: examples from Nordic European countries

Nordic European countries have generated many global niche players. Their governments recognize that then need to encourage more entrepreneurs if they want to provide their people

with highly paid jobs. As a result, they are encouraging universities to commercialize their ideas and generate startups and invest actively in promoting entrepreneurship instead of relying on large local companies to generate business ecosystems on their own.

Developing a niche protects companies from lower costs competition. According to a special report on the Economist (2013), three main factors explain the ability of firms in these countries to develop successful ventures in knowledge intensive niche sectors. First, commitment to relentless innovation and application of the latter to even the most basic industry. Innovation explains the unbaiting success of the interlocking bricks of Lego and the ability of a small country such as Denmark to establish and maintain the position of top eight world exporter of food products, e.g. through applying massively ICT technology to the production and processing of food. Second, and connected to the first item, there is a continuous effort to upgrade processes through the introduction of capital intensive inputs, which increases value addition. Finally, flat governance structured and a culture promoting trust and cooperation allow for consensus-based decisions and long-term planning and create a business-friendly environment at large.

Particularly instructive is how Finland responded to the decline of Nokia, on which the country had become dependent. It has succeeded in fostering the creation of a high numbers of startups producing goods and services as diverse as online gaming, do-it yourself family dining services, automatic recycling systems, and devices that improve people's mood by firing bright light into the ear canal. The cornerstones of the government strategy were three: Creating an agency, Tekes, endowed with a large staff and budget that focused on fostering entrepreneurship; a venture capital fund, Finnvera, to found early stage companies and help them get established; and a large network of business accelerators financed with either fully public money or through public-private partnerships. Such business accelerators offer wide ranges of services, including working spaces, coaching services for new entrepreneurs, trips to Silicon Valley, and plenty of networking opportunities.

Innovation in Finland and in other Nordic companies is intended as something that goes well beyond generation of high-tech. Bridging the gap between engineering and design, innovation in marketing and financing strategies is equally important. The success of Angry Birds, by Rovio Entertainment is due to combining skilled mastering of technology with innovative business strategies. Indeed innovative business models are often what explain the success of many recent Nordic startups, which operate at the low tech end of the spectrum.

5. Considerations for Policy Actions

This report suggests three main approaches to enhance the competitiveness of West Romania firms. First, address distortions in market structure that may limit output growth potential. Second, move to higher value added activities within traditional sectors. Third, create growth in knowledge-intensive sectors.

5.1 Policies fostering an efficient market structure

Market structure is likely to have a bearing on industry growth, employment, and innovation. In this report we demonstrate that output and employment growth are maximized

when competition within the sector is strong. One possible explanation is that competition leads to more innovation. An economic environment consisting of a few leading firms and a wide range of smaller firms appears to be conducive to competition. This finding holds in most manufacturing industries. Results reported in the appendix to this paper show that this is particularly true when considering employment. The key policy recommendation deriving from these findings is therefore that industrial policy should not target specifically small or large firms, but should try to coordinate initiatives that encourage the expansion of few big firms along with the development of a competitive fringe of SMEs.

In West Romania, SMEs are unusually under-represented in some sectors. The assessment of this report is that market structure in West Romania is relatively favorable to output growth in a set of industries that include: rubber and plastics; computer and electronic; electrical equipment; and other manufacturing. Borderline satisfactory market structures seem to be found in apparel; pharmaceutical products; glass; and machinery and equipment. In all other industries, the results indicate that there are too few SMEs, leading to a suboptimal output growth. These industries include food and; textiles; leather products; wood products, pulp and paper; printing; chemicals; metal products; motor vehicles and other transport equipment; and furniture.

5.2 Policies for increasing value addition in traditional sectors

Turning to the strategies to increase value addition in traditional sectors, we focus on three important industries for the West Region: automotive, textiles, and agri-food. In these sectors the key decisions are taken outside the region. In the automotive industry the most important players are original equipment manufacturers and first tier suppliers, while in the food industry the main actors are primarily buyers (i.e. brands, retail chains, etc). Hence, upgrading in these sectors will require an enhanced capacity to meet strict requirements and specifications.

In the automotive sector, key conditions to upgrading are the creation of a well-developed base of local suppliers, with capable management and able to produce high quality parts and components; a well-developed labor market, producing highly skilled but relatively cheap technical experts; and a system of local R&D and innovation to develop prototypes or to produce customized parts and components. Achieving any of the above objectives seems a big challenge for the West Region, unless target public intervention is set in place. To start with, it is hard for West Romanian firms to develop stronger linkages with OEM or first-tier suppliers due to the costs involved to develop the necessary conditions necessary to satisfy stringent quality requirement and get accredited as official suppliers. Limited financial resources do not allow firms to either produce large enough volumes that a multinational company needs or to have the cash flow necessary to allow for discrepancies between investment in production and payments. The second problem lies in a relatively small pool of specialized workforce which constrains expansion plans. Similarly, the scope for developing local R&D and innovation dedicated to the automotive sector is limited in the short term.

In textiles, upgrading can be carried out through two main channels. The first possibility is to engage in process or product innovation via the creation of new machinery or chemical processes. The second possibility is to move upstream or downstream from assembly and other low value added activities, i.e. incorporating higher shares of services as input. Product or process innovation seems precluded for West Romania firms in the short terms. All machinery is imported primarily from three countries (Germany, Italy and Japan) and there is no local expertise to reproduce or even modify such machines to adapt them to the specific needs of individual local firms. Hence the best way to upgrading for West Romania firms is to move upstream or downstream from central low value added activities and to build the skills and capacities for firms to start producing their own design or brand. A successful example of how to achieve this can be found in Turkey. Industry associations and government agencies collaborated to promote Istanbul as a leading fashion center and the government put in place strategies and financing facilities to create a specialized and skilled workforce, to establish fashion design vocational training schools, training students in the use of the latest technologies, fashion, design, product development, specialized photography, media, management, and marketing. The government also granted incentives to firms willing to upgrade into branding (including the reimbursement up to 60% of the cost for a maximum of three years of personnel expenses, machinery, equipment, software, consultancy, and R&D related material), the creation of short courses in marketing, sales, brand management, recruiting, selection strategies and value added production and marketing support to small and medium sized firms and offered training and consulting services to firms to help them build capacity in the sector.

In the agri-food sector, improving the marketing of the local products and establishing linkages with large distribution chains seems to the main challenge in the short term. However, global experience shows that those countries which managed to obtain the biggest value addition from their food production invested heavily in basic and applied research. Hence, upgrading in the agri-food sector should include financial and marketing support for the SMEs in the sector as well as initiatives to promote investment in applied R&D.

5.3 Policies prompting growth in new knowledge intensive, niche sectors

While identifying strategies to increase value added in traditional sectors is important, the economy must also expand in new knowledge intensive niche sectors. The needs of the private ICT sector in West Romania and experiences from countries that succeeded in creating areas of competitive strength in knowledge intensive sectors suggest a number of policy priorities. First, an innovation strategy that goes beyond promoting generation of high-tech. Bridging the gap between engineering and design, innovation in marketing, and financing strategies as well as in business strategies is equally important. Second, a large network of business incubators and accelerators offering a wide range of services, such as: working spaces; coaching services for new entrepreneurs; exposure to foreign experiences, and networking opportunities. Third, financing through venture capital is also recommended, as more rigid forms of financing are not amenable to the specific needs of new entrepreneurship

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Annex 1: SBS data description

Dataset and methodology

The SBS dataset– provided by the National Institute of Statistics of Romania - encompasses complete financial information - at the headquarter level - for the 2005-2010 period for a survey of firms, which is exhaustive for firms with at least 20 employees and a representative sample for firms with less than 20 employees. Namely, the dataset has two strata: i) one completely enumerated covering a census of all enterprises with at least 20 employees; and ii) a random stratum, covering some firms below this size. Based on this sample design, an unbalanced panel is constructed by considering all listed firms (of both strata) for all years. In this way, the panel allows entry and exit and does not impose any firm size threshold. Sampled activities include all sectors, except agriculture and banking. All firms are categorized by industry: from 2005 to 2007, NACE 1.1 (2 digit) classification is used, while NACE 2 (2 digit) classification is applied for the period 2008-2010.

Sample selection and deflation process

A number of restrictions are imposed in order to control for outlier values. First, observations for which information on employment, stock of fixed assets, material costs or value added are missing or lower/equal to zero are dropped from the panel. Second, observations with tangible fixed assets to employee and value added to employee ratios greater (smaller) than three times the standard deviation from the upper (lower) quartile in the corresponding 2-digit sector and year are also dropped from the sample. Table A1.1 displays the final sample that will be used for the analysis over the period 2005 to 2010.

Table A1.1 - Final (SBS) Sample By Region and Year

Region	2005	2006	2007	2008	2009	2010	Total
North-East	3,604	4,454	4,768	5,252	4,925	4,439	27,442
South-East	3,597	4,547	4,779	5,302	4,991	4,650	27,866
South-Muntenia	3,429	4,274	4,712	5,137	5,036	4,693	27,281
South-West Oltenia	2,120	2,768	3,106	3,466	3,351	3,131	17,942
West	3,091	4,006	4,236	4,569	4,332	4,059	24,293
North-West	4,396	5,389	5,823	6,202	6,061	5,604	33,475
Center	4,257	5,326	5,704	6,046	5,784	5,382	32,499
Bucharest-Ilfov	8,671	8,705	9,561	10,711	10,588	9,894	58,130
Total	33,165	39,469	42,689	46,685	45,068	41,852	248,928

Source: World Bank staff elaboration based on SBS data

All accounting data is in Romanian Lei. Nominal values are deflated with country or sector-level deflator to express values in 2000 Romanian Lei. Distinct deflation criteria were adopted according to each variable. Value added (at factor cost) and turnover were deflated using sector deflators (built on AMECO dataset). The following broad sector groups were used:

industry excluding building and construction; building and construction; services; finance and business services; and manufacturing industry.[14] Stock of capital, export and import values as well as income from selling finished products or from selling performed works and delivered services were deflated by "Price deflator gross domestic product at market prices" (from AMECO database). Finally, cost of materials (raw material and consumable material costs and other material costs) were deflated by "Price deflator Energy" (built on ESA95 data).

Performance indicators

Once the nominal values were deflated, four main performance indicators were computed for each firm: labor productivity, capital productivity, unit labor cost, and total factor productivity.

Labor productivity was defined as real value added (at factor cost), deflated by sector deflator, over (average) number of (full time) employees. Capital productivity was defined as real value added over real stock of capital (deflated by GDP deflator). Unit Labor Cost was defined as wage bill by real value added (at factor cost), deflated by GDP deflator. Finally, total factor productivity (TFP) is estimated using the methodology of Levinsohn and Petrin (2003), as explained in Box 2.

Analytical categories

Firms are classified according to four main categories: age, size, ownership and international exposure.

Age category is built on Business Registry database (also provided by the INS – Romania), and uses information of "year of incorporation". The following classes are defined: "1-5 years old", "16-12 years old", and ">=13 years old".

Size classes are based on (average) number of (full) time employees per year, according to SBS dataset. Four size groups are listed: "1-19", "20-49", "50-249", and">=250".

The ownership category is built on SBS information of ownership type, according to the INS-SBS questionnaire. Originally, the exhaustive list of ownership type is defined as described in Table A1.2.

[14] Value added is also deflated by "price deflator gross domestic product at market prices" (from AMECO data) in order to compute Unit Labor Cost.

Table A1.2 -. Exhaustive list of ownership categories

1	"fully state“
2	"major_state(state+privateRom)“
3	"major_state(state+foreign)”
4	"major_state(state+privateRom+foreign)“
5	"major_private(state+privateRom)“
6	"major_private(state+foreign)“
7	"major_private(state+privateRom+foreign)”
8	"fully_private(privateRom)“
9	"fully_private(privateRom+foreign)“
10	"cooperative“
11	"public“
12	"fully_foreign“
13	"public,national interest"

In addition to ownership category, three other alternative classifications were defined by grouping some of the original ownership classes (see Table).

Table A1.3- Alternative list of ownership categories

1	"fully state“
2	" major_state“
3	"major_private“
4	"fully_private“
5	"cooperative“
6	"public“
7	"fully state“

1	"state“
2	"private“
3	"cooperative“
4	"public"

1	"fully foreign“*
2	"others"

Note: *It is not possible to identify the percentage of foreign ownership in the following categories: "major_private (state+foreign)","major_private (state+privateRom+foreign)",and “fully_private (privateRom+foreign)". For this reason foreign owned firms are only classified by three categories: fully foreign owned, partially foreign owned, and fully domestic.

Sector Clusters

Among all NACE activities covered by the SBS dataset, some specific sector clusters deserve particular attention: ICT, automotive; agro-food; textiles and leather; tourism; construction; energy; and health. The following tables display the precise NACE 2 description

of each one of them. It is worth acknowledging that since information on NACE 2 sector is available only for the 2008-2010 period, all cluster analysis is restricted to this time period.

Table A1.4 . ICT cluster: NACE 2 sector list

Sector	NACE CODES	Comments
ICT	261	all (Eurostat definition)
	262	all (Eurostat definition)
	263	all (Eurostat definition)
	264	all (Eurostat definition)
	268	all (Eurostat definition)
	474	all (our definition)
	582	all (Eurostat definition)
	611	all (our definition)
	612	all (our definition)
	62	all (Eurostat definition)
	63	all (Eurostat definition)
	582	all (Eurostat definition)
	951	all (Eurostat definition)

Table A1.5.Automotive cluster: NACE 2 sector list

Sector	NACE CODES	Comments
Automotive	1392	textile article but no clothes (optional choice)
	2219	fabrication rubber products
	2222	fabrication plastic products
	2229	fabrication plastic products
	2433	steel processing
	2511	metal processing
	2550	metal processing
	2572	metal processing
	2573	metal processing
	2593	metal processing
	2732	wires production
	2740	electric lightning equipment
	2790	electric equipment
	2822	equipments
	2841	tools making
	2849	equipments&tools making
	2892	equipments&tools making
	2899	equipments&tools making
	29	all (car manufacture)
	3299	industrial activities

Table A1.6. Agro-food cluster: NACE 2 sector list

Sector	NACE CODES	Comments

Agro food	011-016	all (agriculture)
	03	all (fishing&acvaculture)
	10	all (food processing)
	11	all (beverage)

Table A1.7. Textiles and leather cluster: NACE 2 sector list

Sector	NACE CODES	Comments
Textiles&leather	13	all without 1392
	14	all
	15	all

Table A1.8. Tourism cluster: NACE 2 sector list

Sector	NACE CODES	Comments
Tourism	55	all (country definition)
	56	all (country definition)
	79	all (services regarding tour-operators&booking)
	932	all (services regarding entertainment)

Table A1.9. Construction cluster: NACE 2 sector list

Sector	NACE CODES	Comments
Construction	41	all (country definition)
	42	all (country definition)
	43	all (country definition)

Table A1.10. Energy cluster: NACE 2 sector list

Sector	NACE CODES	Comments
Energy	35	all (country definition)

Table A1.11. Health cluster: NACE 2 sector list

Sector	NACE CODES	Comments
Health	86	all (country definition)
	87	all (country definition)
	88	all (country definition)

Annex 2. Benchmarking performance indicators across regions through OLS estimations

This section focuses on firm heterogeneity across regions. In order to do that, the average percent difference of basic performance indicators (labor productivity, TFP and unit labor cost) across regions is estimated. A two-step procedure was adopted. First, an OLS model - for 2010 - of the log performance indicators (TFP, labor productivity and ULC) on region dummies and sector (2 digit) effects was estimated.[15] Second, the region coefficients in the log-linear model are transformed according to (exp(beta)-1)*100.

Table A2. 1. OLS results: all 2 digit sectors, 2010

	ln(TFP)	ln(Lab prod)	Ln(ULC)
North-East	-0.4945***	-0.4583***	0.0036
	(0.019)	(0.019)	(0.017)
South-East	-0.4095***	-0.3975***	0.0066
	(0.019)	(0.019)	(0.017)
South-Muntenia	-0.3738***	-0.3609***	0.0007
	(0.019)	(0.019)	(0.017)
South-West Oltenia	-0.5593***	-0.5323***	0.0302
	(0.021)	(0.021)	(0.020)
West	-0.4049***	-0.4136***	0.0643***
	(0.019)	(0.019)	(0.018)
North-West	-0.3726***	-0.3593***	0.0025
	(0.018)	(0.018)	(0.016)
Center	-0.3441***	-0.3469***	0.0438***
	(0.018)	(0.018)	(0.016)
_cons	5.9113***	10.7008***	-0.6661**
	(0.286)	(0.286)	(0.264)
R-squared	0.7143	0.1691	0.0759
N. obs	4.19E+04	4.19E+04	4.19E+04

Note: Standard Errors in parenthesis, stars indicate t-probabilities (* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$). Base year is 2010. Bucharest-Ilfov is the reference region. The (2digit) sector digit fixed effects are not reported.

[15] When working with sector clusters, industry fixed effects are not included. The benchmark region is Bucharest-Ilfov

Table A2. 2. OLS results: ICT cluster, 2010

	ln(TFP)	ln(Lab prod)	Ln(ULC)
North-East	-0.2588**	-0.7073***	-0.2678**
	(0.114)	(0.125)	(0.114)
South-East	-0.4434***	-0.9264***	-0.1775
	(0.131)	(0.143)	(0.131)
South-Muntenia	-0.2633**	-0.7096***	-0.2974**
	(0.127)	(0.138)	(0.126)
South-West Oltenia	-0.4576***	-0.7703***	-0.0624
	(0.121)	(0.132)	(0.121)
West	-0.3492***	-0.7642***	0.1699
	(0.112)	(0.123)	(0.112)
North-West	-0.2016**	-0.4998***	-0.0194
	(0.097)	(0.106)	(0.097)
Center	-0.1697*	-0.4629***	-0.0314
	(0.100)	(0.109)	(0.100)
_cons	6.4379***	10.4823***	-0.2193***
	(0.047)	(0.051)	(0.047)
R-squared	0.0333	0.1154	0.0184
N. obs	856	856	856

Note: Standard Errors in parenthesis, stars indicate t-probabilities (* p < 0:05; ** p < 0:01; ***p < 0:001). Base year is 2010. Bucharest-Ilfov is the reference region.

Table A2. 3. OLS results: Auto cluster, 2010

	ln(TFP)	ln(Lab prod)	Ln(ULC)
North-East	-0.3629***	-0.3092***	-0.1049
	(0.085)	(0.090)	(0.081)
South-East	-0.1163	-0.1241	-0.1167
	(0.084)	(0.089)	(0.080)
South-Muntenia	-0.0251	0.0022	-0.0521
	(0.075)	(0.079)	(0.071)
South-West Oltenia	-0.1933**	-0.1749*	-0.1132
	(0.091)	(0.096)	(0.086)
West	0.066	0.0259	-0.0221
	(0.074)	(0.079)	(0.071)
North-West	-0.0775	-0.0702	-0.0776
	(0.072)	(0.076)	(0.068)
Center	0.0125	0.0011	0.0189
	(0.070)	(0.074)	(0.067)
_cons	7.6839***	10.3905***	-0.0426
	(0.052)	(0.056)	(0.050)
R-squared	0.019	0.012	0.0038
N. obs	1788	1788	1788

Note: Standard Errors in parenthesis, stars indicate t-probabilities (* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$). Base year is 2010. Bucharest-Ilfov is the reference region.

Table A2. 4. OLS results: Textile cluster, 2010

	ln(TFP)	ln(Lab prod)	Ln(ULC)
North-East	-0.0224	-0.0453	-0.0059
	(0.067)	(0.064)	(0.054)
South-East	-0.1196	-0.1353*	-0.0113
	(0.074)	(0.070)	(0.059)
South-Muntenia	-0.0974	-0.1318*	0.032
	(0.074)	(0.070)	(0.059)
South-West Oltenia	-0.0706	-0.1182	-0.0368
	(0.080)	(0.077)	(0.065)
West	0.1695**	0.1206*	0.0068
	(0.069)	(0.066)	(0.055)
North-West	0.0847	0.0239	-0.0129
	(0.063)	(0.060)	(0.051)
Center	0.0901	0.0216	0.0513
	(0.065)	(0.062)	(0.052)
_cons	9.9286***	9.8492***	0.1261***
	(0.051)	(0.049)	(0.041)
R-squared	0.0147	0.0122	0.0018
N. obs	2134	2134	2134

Note: Standard Errors in parenthesis, stars indicate t-probabilities (* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$). Base year is 2010. Bucharest-Ilfov is the reference region.

Table A2. 5. OLS results: Food cluster, 2010

	ln(TFP)	ln(Lab prod)	Ln(ULC)
North-East	-0.3299***	-0.2820***	0.0478
	(0.080)	(0.078)	(0.069)
South-East	-0.2616***	-0.2509***	0.0458
	(0.082)	(0.080)	(0.070)
South-Muntenia	-0.2478***	-0.2799***	0.0969
	(0.080)	(0.078)	(0.069)
South-West Oltenia	-0.5001***	-0.4943***	0.1186
	(0.095)	(0.092)	(0.081)
West	-0.4327***	-0.4169***	0.2608***
	(0.090)	(0.087)	(0.077)
North-West	-0.3689***	-0.3277***	0.1125
	(0.080)	(0.078)	(0.069)
Center	-0.2319***	-0.2306***	0.1128*
	(0.080)	(0.078)	(0.068)
_cons	9.0215***	10.2887***	-0.2006***
	(0.058)	(0.056)	(0.050)
R-squared	0.0189	0.0179	0.0064
N. obs	2159	2159	2159

Note: Standard Errors in parenthesis, stars indicate t-probabilities (* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$). Base year is 2010. Bucharest-Ilfov is the reference region.

Table A2. 6. OLS results: Health cluster, 2010

	ln(TFP)	ln(Lab prod)	Ln(ULC)
North-East	1.093	0.0415	0.2781
	(1.554)	(1.047)	(1.234)
South-East	-0.8307	-3.3122***	3.2661**
	(1.554)	(1.047)	(1.234)
South-Muntenia	-0.3854	-0.7054	0.6557
	(0.802)	(0.541)	(0.637)
South-West Oltenia	-0.9446	-0.4348	-0.1907
	(1.144)	(0.771)	(0.908)
West	0.2635	-0.2676	-0.1497
	(0.802)	(0.541)	(0.637)
North-West	0.0102	-0.2086	-0.0811
	(0.969)	(0.653)	(0.769)
Center	0.9462	-0.0628	-0.5903
	(0.869)	(0.585)	(0.690)
_cons	2.1857***	9.2072***	-0.2094
	(0.449)	(0.302)	(0.356)
R-squared	0.1346	0.3189	0.2977
N. obs	32	32	32

Note: Standard Errors in parenthesis, stars indicate t-probabilities (* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$). Base year is 2010. Bucharest-Ilfov is the reference region.

Table A2. 7. OLS results: Tourism cluster, 2010

	ln(TFP)	ln(Lab prod)	Ln(ULC)
North-East	-0.4558***	-0.2934***	-0.0296
	(0.091)	(0.084)	(0.080)
South-East	-0.4335***	-0.2993***	0.0567
	(0.085)	(0.079)	(0.075)
South-Muntenia	-0.3748***	-0.2244***	-0.0506
	(0.093)	(0.086)	(0.082)
South-West Oltenia	-0.5618***	-0.3551***	-0.0107
	(0.106)	(0.098)	(0.093)
West	-0.5363***	-0.3806***	0.096
	(0.098)	(0.091)	(0.086)
North-West	-0.4209***	-0.2830***	0.0435
	(0.091)	(0.084)	(0.079)
Center	-0.3874***	-0.2793***	0.0819
	(0.087)	(0.081)	(0.076)
_cons	9.9645***	9.3907***	-0.0524
	(0.053)	(0.049)	(0.047)
R-squared	0.033	0.0179	0.0027
N. obs	1724	1724	1724

Note: Standard Errors in parenthesis, stars indicate t-probabilities (* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$). Base year is 2010. Bucharest-Ilfov is the reference region.

Table A2. 8. OLS results: Construction cluster, 2010

	ln(TFP)	ln(Lab prod)	Ln(ULC)
North-East	-0.4141***	-0.4288***	0.1193**
	(0.056)	(0.058)	(0.054)
South-East	-0.3596***	-0.4302***	0.1662***
	(0.058)	(0.061)	(0.056)
South-Muntenia	-0.3548***	-0.3899***	0.1563***
	(0.055)	(0.057)	(0.053)
South-West Oltenia	-0.4956***	-0.4840***	0.0571
	(0.065)	(0.068)	(0.063)
West	-0.3579***	-0.3786***	0.0729
	(0.060)	(0.063)	(0.059)
North-West	-0.3525***	-0.3174***	-0.0079
	(0.053)	(0.056)	(0.051)
Center	-0.3571***	-0.3662***	0.1317**
	(0.055)	(0.057)	(0.053)
_cons	8.5339***	10.0032***	-0.3642***
	(0.032)	(0.033)	(0.031)
R-squared	0.0249	0.0246	0.0045
N. obs	4446	4446	4446

Note: Standard Errors in parenthesis, stars indicate t-probabilities (* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$). Base year is 2010. Bucharest-Ilfov is the reference region.

Table A2. 9. OLS results: Energy cluster, 2010

	ln(TFP)	ln(Lab prod)	Ln(ULC)
North-East	-1.1139***	-1.3655***	0.6980***
	(0.330)	(0.294)	(0.268)
South-East	-0.8087**	-1.1504***	0.4682*
	(0.334)	(0.298)	(0.272)
South-Muntenia	-0.8146**	-1.4961***	0.9268***
	(0.404)	(0.360)	(0.329)
South-West Oltenia	-0.3249	-1.2826***	0.4196
	(0.457)	(0.407)	(0.371)
West	-1.1613***	-1.4517***	0.7949**
	(0.386)	(0.343)	(0.313)
North-West	-0.8229**	-0.7640**	0.5160*
	(0.356)	(0.317)	(0.289)
Center	-1.0140***	-1.0846***	0.4841*
	(0.321)	(0.286)	(0.261)
_cons	10.6859***	11.4784***	-0.9010***
	(0.171)	(0.152)	(0.139)
R-squared	0.0941	0.1779	0.0672
N. obs	224	224	224

Note: Standard Errors in parenthesis, stars indicate t-probabilities (* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$). Base year is 2010. Bucharest-Ilfov is the reference region.

Annex 3. The importance of market structure for growth and employment

This appendix provides a more complete description of the econometric results on the importance of market structure for growth and employment, discussed in Section 4 and draw from the background note to this report Crozet et al (2013).

Econometric Results: Amadeus

In this section, we present results using the Amadeus dataset of the estimations presented in Section 4 of the report.

This dataset compiles balance sheet information for a very large set of companies located in 41 European countries. Firms in Amadeus are classified according to their primary activity. In addition, we select information on employment and output. To make our analysis sensible, we get rid of countries for which information is available for less than 100 firms, and country-sector groups with less than 10 firms. We are left with 29 countries[16], and 25 manufacturing industries. The year coverage goes from 2005 to 2010, which enables us to distinguish between a "pre-crisis" period (2005-2007) and a "post-crisis" period (2008-2010). We select firms for which information on employment and turnover is available over the whole period. This leaves us with on average 500,000 firms each year in this database.

We focus first on simple bivariate regressions where each of our indicators of market structure is introduced separately to explain the growth of either employment or output. These first regressions should tell us how each characteristic of the firms' size distribution is correlated with output or employment growth. We will then introduce interaction terms to see how these characteristics move with one another.

Univariate regressions

Total Employment

Table A3.1 reports our estimates of equation (2), considering total employment as the performance variable. In addition to first differences, we introduce both country-industry and year fixed effects. This specification is the one using most of the available observations. Each column reports a single regression, using a different variable to characterize the distribution of firms' size. Table A3.2 is a robustness check of Table A3.1, where we control for the initial level of total employment. In addition, we restrain the sample to two non-overlapping 3-years periods: a pre-crisis period (2005-2007) and a post-crisis period (2008-2010). Finally, in Table A3.3, we further control for the initial level of the selected characteristics of the distribution of

[16] Countries are: Belgium, Bosnia-Herzegovina, Bulgaria, Czech Republic, Switzerland, Germany, Denmark, Germany, Spain, Estonia, Finland, France, the United Kingdom, Greece, Hungary, Croatia, Italia, Lithuania, Latvia, Macedonia, the Netherlands, Poland, Portugal, Romania, Russia, Slovakia, Slovenia, Sweden and Ukraine.

firms' size. Results on the variable of interests (first line of each table) are qualitatively not affected (but slightly smaller in magnitude), when moving from Table A3.1 to Table A3.2, or to Table A3.3.

The first indicator we use is the Herfindahl index. It is negatively correlated with employment, suggesting that the expansion of big firms is detrimental to employment growth in the industry: when large firms increase their market share in the industry, they expand less employment, meaning that they benefit from higher labor productivity. Expansion of a given industry goes with significant increase in the dispersion and in the skewness of the distribution of firms' size. This tells us that on average in a given country-industry group, firms with an above-average size are driving the growth of employment. The larger these firms are compare to firms with a below-average size – meaning the more skewed is the distribution of employment – the larger is the growth of total employment. The result on the size of the median firm gives us very interesting additional information. The negative sign we find here indicates that industry that grow faster are the one where the size of the median firm decreased. This confirms the result we find on the dispersion and skewness: growth is driven by large firms, rather than small firms. Putting these three results together give us the following picture: Competition is good for growth of employment. If we assume that firms with a small market share have low levels of employment, this tells us that small firms are growing (and increasing their market share, thereby lowering the Herfindahl). The more concentrated the market is, the lower the growth of employment. The smaller the median firm the stronger the growth of employment too. However, stronger dispersion or skewness also fosters employment growth. Finally, results on the average size of firms are not robust across specifications, which is not very surprising: large dispersion with smaller firms means that the size of the average firm is subject to opposing forces. The insignificant sign we find is therefore not very surprising.

Figures (A3.1) to (A3.6) present graphically the results obtained in Table A3.1 for the Herfindahl index, the dispersion of employment (measured by the standard deviation) and the size of the median firm for two periods: 2005-2007 and 2008-2010. Again, these figures show simple correlations. Each circle represents a country-industry group, and the width of the circle represents the number of firms in each particular group. First, the regression results in Table 1 are graphically confirmed here: the growth of the Herfindahl index and the median firm is negatively correlated with the growth of employment, while higher dispersion is positively correlated with employment growth. Results are confirmed in both periods, which indicate that the crisis period does not affect the robustness of our results.

We push the analysis a step further by looking at whether the industry characteristics we are using the characterize employment growth are as important in low GDP per capita and high GDP per capita countries, or when multinational enterprises are strongly present in given industry. This is done in Tables A3.4 and A3.5. In Table A3.4, high GDP per capita countries encompass Western European countries, plus Slovenia, while the group of countries with low GDP per capita is made of Central and Eastern European countries. In Table 5, high FDI and low FDI are within industry dimensions. They are simple indicators of the share of multinational

firms in the industry employment. If, in a given industry, a country has an above-average share of multinational enterprises, then it is assigned to the "high FDI" group. We want to know to which extent are multinational firms driving the growth of employment.

We find that results are more pronounced when our independent variables is interacted with the level of development of the country. The dispersion of employment in the industry (whether it is measured by the skewness or the standard deviation of the distribution) seems to be more important for employment growth in countries with below average GDP per capita. Competition (measured by the Herfindahl) does not seem to be more important in high-income countries than in lower-income countries. Regarding the importance of multinational firms in a given industry (Table A3.5), results seem to be slightly stronger when multinational are relatively less present. When multinational make up a large share of employment, firms' distribution characteristics such as competition or dispersion of employment are less correlated with growth of industry employment.

Overall, results show that the expansion of manufacturing employment is driven a greater dispersion and skewness of the distribution of firms' size. However, larger firms having higher labor productivity, the domination of the industry by a small number of big firms seems to generate fewer jobs.

Table A3.1: Total Employment - First difference 2003-2010 (one year growth / overlapping periods)

Dependent variable: $\Delta \ln(Total\ Employment_{ikt})$					
Distribution var :	Herfindahl	SdDev Emp	Skewness	Median Size	Mean Size
$\Delta \ln(Distribution_{ikt})$	-0.160a	0.638a	0.432a	-0.109a	0.317a
	(0.04)	(0.05)	(0.03)	(0.03)	(0.07)
Nb. Obs.	4409	4409	4405	4409	4409
R^2	0.071	0.310	0.245	0.052	0.142

Source: Crozet et al (2013)
Note: OLS with country-industry and year fixed-effects. Robust standard errors are reported in parentheses.
Significance levels: a ($p < 0,01$), b ($p < 0,05$), c ($p < 0.01$).

Table A3.2: Total Employment – Two non-overlapping periods 2005-2007 / 2008-2010 (3 years growth)

Dependent variable: $\Delta \ln(Total\ Employment_{ikt})$					
Distribution var :	Herfindahl	SdDev	Skewness	Median Size	Mean Size
$\Delta \ln(Distribution_{ikt})$	-0.085a	0.407a	0.270a	-0.153a	-0.014
	(0.03)	(0.04)	(0.03)	(0.02)	(0.05)
$\ln(Total\ Employment_{ikt0})$	-0.935a	-0.824a	-0.807a	-0.906a	-0.977a
	(0.04)	(0.03)	(0.04)	(0.04)	(0.03)
Nb. Obs.	1259	1259	1259	1259	1259
R^2	0.767	0.825	0.809	0.785	0.757

Source: Crozet et al (2013)
Note: OLS with country-industry and year fixed-effects. Robust standard errors are reported in parentheses.
Significance levels: a ($p < 0,01$), b ($p < 0,05$), c ($p < 0.01$).

Table A3.3: Total Employment – Two non-overlapping periods 2005-2007 / 2008-2010 (3 years

growth) – Controlling for initial levels

Dependent variable: $\Delta \ln(Total\ Employment_{ikt})$

Distribution var :	Herfindahl	SdDev	Skewness	Median Size	Mean Size
$\Delta \ln(Distribution_{ikt})$	-0.129a	0.660a	0.422a	-0.193a	0.047
	(0.05)	(0.06)	(0.04)	(0.03)	(0.09)
$\ln(Distribution_{ik0})$	-0.083	0.538a	0.320a	-0.089c	0.117
	(0.06)	(0.06)	(0.04)	(0.05)	(0.10)
$\ln(Total\ Employment_{ikt0})$	-0.956a	-0.918a	-0.904a	-0.916a	-0.977a
	(0.04)	(0.03)	(0.04)	(0.04)	(0.03)
Nb. Obs.	1259	1259	1259	1259	1259
R^2	0.770	0.854	0.827	0.787	0.760

Source: Crozet et al (2013)

Note: OLS with country-industry and year fixed-effects. Robust standard errors are reported in parentheses. Significance levels: a (p < 0,01), b (p < 0,05), c (p < 0.01).

Table A3.4: Total Employment – First difference 2003-2010 (one year growth / overlapping periods) – Interaction with GDP per capita

Dependent variable: $\Delta \ln(Total\ Employment_{ikt})$

Distribution var :	Herfindahl	SdDev	Skewness	Median Size	Mean Size
$\Delta \ln(Distribution_{ikt})$	-0.14a	0.58a	0.34a	-0.06a	0.39a
X High GDP cap.	(0.04)	(0.07)	(0.03)	(0.02)	(0.09)
$\Delta \ln(Distribution_{ik0})$	-0.18a	0.71a	0.55a	-0.31a	0.27a
X Low GDP cap.	(0.06)	(0.07)	(0.05)	(0.07)	(0.11)
Nb. Obs.	4409	4409	4405	4409	4409
R^2	0.07	0.31	0.26	0.07	0.15

Source: Crozet et al (2013)

Note: OLS with country-industry and year fixed-effects. Robust standard errors are reported in parentheses. Significance levels: a (p < 0,01), b (p < 0,05), c (p < 0.01).

Table A3.5: Total Employment – First difference 2003-2010 (one year growth / overlapping periods) – Interaction with Multinational activity

Dependent variable: $\Delta \ln(Total\ Employement_{ikt})$

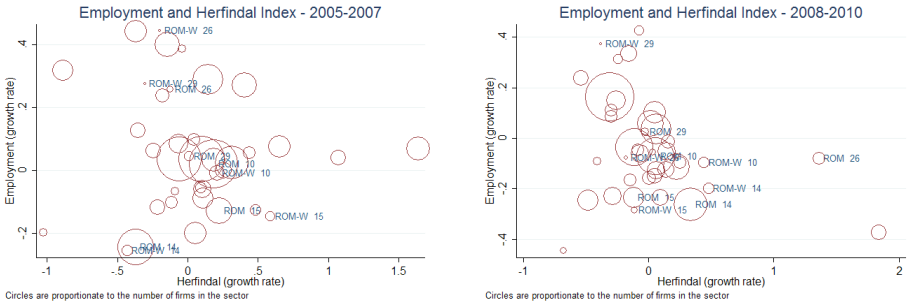
Distribution var :	Herfindahl	SdDev	Skewness	Median Size	Mean Size
$\Delta \ln(Distribution_{ikt})$	-0.143a	0.480a	0.289a	-0.032	0.250a
X High FDI	(0.05)	(0.08)	(0.06)	(0.05)	(0.12)
$\ln(Distribution_{ik0})$	-0.215a	0.515a	0.423a	-0.149b	0.047
X Low FDI.	(0.07)	(0.07)	(0.06)	(0.06)	(0.12)
Nb. Obs.	2567	2567	2567	2567	2567
R^2	0.130	0.306	0.304	0.091	0.094

Source: Crozet et al (2013)

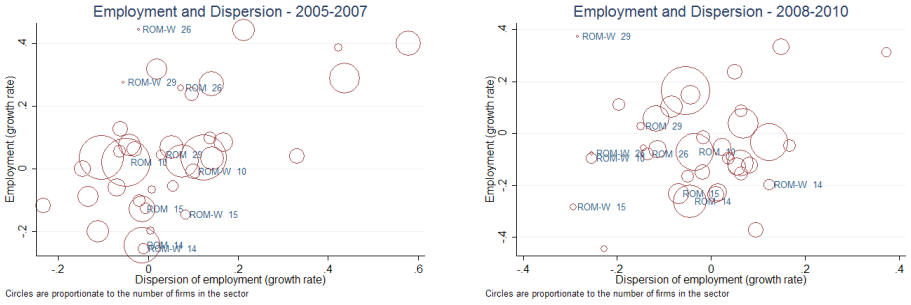
Note: OLS with country-industry and year fixed-effects. Robust standard errors are reported in parentheses. Significance levels: a (p < 0,01), b (p < 0,05), c (p < 0.01).

Figure A3.1 : Change in Total employment, Herfindahl index, Standard deviation, and median of firms' size

Change in total employment vs Herfindal Index



Change in total employment vs standard deviation



Change in total employment vs median firm size

Source: Crozet et al (2013)

Total turnover

We now turn to the growth of total turnover. We merely perform the same exercise, and use the growth of turnover as our dependent variable instead. Results are qualitatively identical to the one found in the previous section. The Herfindahl index, however, is positively correlated with growth of turnover in the first Table, but this correlation is not robust to alternative specifications (Tables A3.7, A3.8 and A3.9). Changes in the degree of competition are not robustly correlated with the growth of industry output in our sample. A larger dispersion in the size distribution of firms, however, is positively correlated with the growth of industry output. Moreover, the skewness is positively correlated with output growth, meaning that a dispersion biased toward larger firms is correlated with higher output growth. This is confirmed by the size of the median firm being negatively correlated with output growth. As in

the previous section, we find that the growth of output is driven by large firms associated with many small firms. Again, the average size of firms does not have any significant effect, as it is the combination of two opposite forces: larger dispersion, but lower size for the median firm.

Heterogeneous effects arise when we split countries according to their GDP per capita level (Table A3.9). We find that competition matters in high GDP per capita countries, as well as larger dispersion. The presence of smaller firms, however, (approximated by the median size variable) does not seem to be affecting the growth of output. These results suggest that in high GDP per capita countries, growth of output is ultimately driven by large firms. In lower GDP per capita countries, however, competition does seem to prevail, while dispersion and the presence of many small firms are more important for industry output growth. We then assess the importance of multinational activity in output growth. As in Table (A3.5), each characteristic of the firms' size distribution is interacted with the importance of multinational firm in the sector. The insignificant effect of changes in competition we found in the previous tables is confirmed here. On the other hand, greater dispersion seems to be more important in sectors where multinational firms are less present. Again, the presence of smaller firms is positively correlated with output growth only in country-sectors where multinationals make a relatively large share of employment.

Overall, results suggest that the expansion of manufacturing sectors is driven by two factors: a large population of relatively small firms and the existence of some large ones.

Table A3.6: Total Turnover - First difference 2003-2010 (one year growth / overlapping periods)

Dependent variable: $\Delta \ln(Total\ Turnover_{ikt})$					
Distribution var :	Herfindahl	SdDev	Skewness	Median Size	Mean size
$\Delta \ln(Distribution_{ikt})$	0.117a	0.289a	0.265a	-0.085a	0.025
	(0.05)	(0.04)	(0.03)	(0.02)	(0.04)
Nb. Obs.	4409	4409	4405	4409	4409
R^2	0.099	0.132	0.153	0.091	0.081

Source: Crozet et al (2013)
Note: OLS with country-industry and year fixed-effects. Robust standard errors are reported in parentheses.
Significance levels: a ($p < 0,01$), b ($p < 0,05$), c ($p < 0.01$).

Table A3.7: Total Turnover – Two non-overlapping periods 2005-2007 / 2008-2010 (3 years growth)

Dependent variable: $\Delta \ln(Total\ Turnover_{ikt})$					
Distribution var :	Herfindahl	SdDev	Skewness	Median Size	Mean size
$\Delta \ln(Distribution_{ikt})$	0.030	0.238a	0.172a	-0.122a	-0.065
	(0.04)	(0.05)	(0.03)	(0.03)	(0.04)
$\ln(Total\ Turnover_{ikt0})$	-0.963a	-0.904a	-0.870a	-0.910a	-0.942a
	(0.07)	(0.07)	(0.08)	(0.07)	(0.07)
Nb. Obs.	1259	1259	1259	1259	1259
R^2	0.701	0.719	0.717	0.713	0.702

Source: Crozet et al (2013)
Note: OLS with country-industry and year fixed-effects. Robust standard errors are reported in

parentheses. Significance levels: a (p < 0,01), b (p < 0,05), c (p < 0.01).

Table A3.8: Total Turnover – Two non-overlapping periods 2005-2007 / 2008-2010 (3 years growth) – Controlling for initial levels

Dependent variable: $\Delta \ln(Total\ Turnover_{ikt})$

Distribution var :	Herfindahl	SdDev	Skewness	Median Size	Mean Size
$\Delta \ln(Distribution_{ikt})$	0.084	0.403a	0.290a	-0.217a	-0.158c
	(0.07)	(0.08)	(0.05)	(0.04)	(0.08)
$\ln(Distribution_{ik0})$	0.095	0.313a	0.222a	-0.205a	-0.178
	(0.08)	(0.09)	(0.07)	(0.06)	(0.011)
$\ln(Total\ Turnover_{ikt0})$	-0.955a	-0.931a	-0.913a	-0.922a	-0.941a
	(0.07)	(0.07)	(0.09)	(0.07)	(0.07)
Nb. Obs.	1259	1259	1259	1259	1259
R^2	0.703	0.727	0.724	0.722	0.707

Source: Crozet et al (2013)
Note: OLS with country-industry and year fixed-effects. Robust standard errors are reported in parentheses.
Significance levels: a (p < 0,01), b (p < 0,05), c (p < 0.01).

Table A3.9: Total Turnover – First difference 2003-2010 (one year growth / overlapping periods) – Interaction with GDP per capita

Dependent variable: $\Delta \ln(Total\ Turnover_{ikt})$

Distribution var :	Herfindahl	SdDev	Skewness	Median Size	Mean Size
$\Delta \ln(Distribution_{ikt})$	0.20a	0.21a	0.17a	-0.03c	-0.00
X High GDP cap.	(0.05)	(0.05)	(0.03)	(0.02)	(0.05)
$\ln(Distribution_{ik0})$	0.02	0.38a	0.39a	-0.28a	0.06
X Low GDP cap.	(0.07)	(0.06)	(0.05)	(0.06)	(0.07)
Nb. Obs.	4409	4409	4405	4409	4409
R^2	0.11	0.14	0.17	0.11	0.08

Source: Crozet et al (2013)
Note: OLS with country-industry and year fixed-effects. Robust standard errors are reported in parentheses.
Significance levels: a (p < 0,01), b (p < 0,05), c (p < 0.01)

Table A3.10: Total Turnover – First difference 2003-2010 (one year growth / overlapping periods) – Interaction with Multinational activity

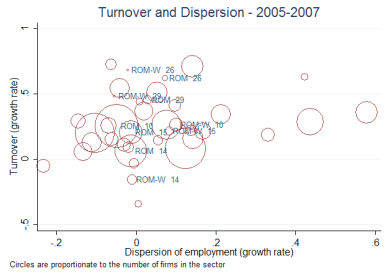
Dependent variable: $\Delta \ln(Total\ Turnover_{ikt})$

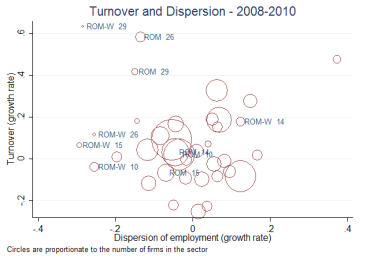
Distribution var :	Herfindahl	SdDev Emp	Skewness	Median Size	Mean Size
$\Delta \ln(Distribution_{ikt})$	0.129	0.188a	0.179a	-0.037	-0.012
X High FDI	(0.09)	(0.06)	(0.05)	(0.05)	(0.07)
$\ln(Distribution_{ik0})$	0.047	0.236a	0.268a	-0.116b	-0.086
X Low FDI.	(0.09)	(0.06)	(0.06)	(0.05)	(0.10)
Nb. Obs.	2567	2567	2567	2567	2567
R^2	0.145	0.170	0.210	0.147	0.136

Source: Crozet et al (2013)
Note: OLS with country-industry and year fixed-effects. Robust standard errors are reported in parentheses.
Significance levels: a (p < 0,01), b (p < 0,05), c (p < 0.01).

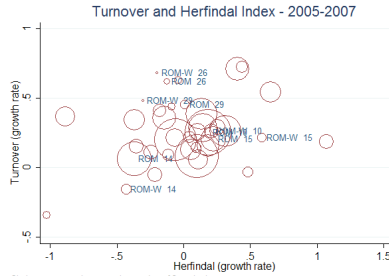
Figure A3.2 Change in Total turnover, Herfindahl index , Standard deviation, and median of firms' size

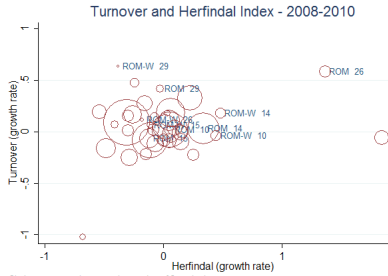
Change in total turnover vs Herfindal Index



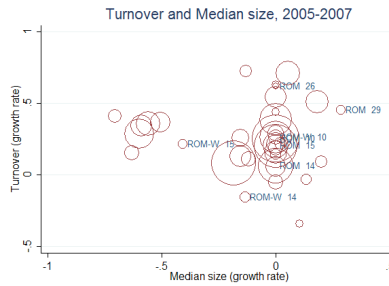


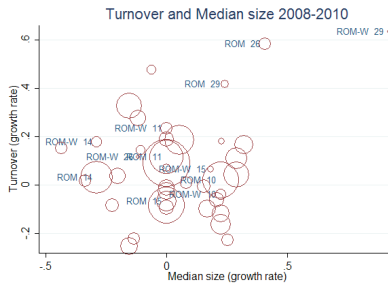
Change in total turnover vs standard deviation





Change in total turnover vs median firm size





Source: Crozet et al (2013)

Pooled results: bivariate regressions

Total Employment

We now combine two moments of the firms' distribution: one aiming at measuring the centrality of the distribution, and the other at measuring the dispersion. We have two possible specifications: the mean size and the skewness of the distribution on the one hand; the median size and the standard deviation on the other hand[17]. These specifications will allow us to confirm of infirm the intuition the univariate regressions gave us: that employment and output growth is stronger when the industry is made of some big firms and many small ones.

[17] We scaled the standard deviation by the mean of the distribution, which is why we do not include both the mean and the standard deviation in the same specification.

As an additional control, we interact the two variables (mean-size interacted with skewness, and median size interacted with standard deviation). This interaction term is of particular interest. In the first regression (second column in Table A3.11), the interaction term indicates how, for a given average size of the industry, the dispersion of firms affects the growth or total employment. The non-interacted terms in column 2 indicate that larger firm and more skewed distributions firms are positively correlated with the growth of employment. The interaction term on the other hand indicates that for a given skewness of the distribution, the smaller the average size the better, which confirms the intuition we had with the results in the previous section. This intuition is also confirmed by the second regression which uses the size of the median firm and the dispersion of employment as exogenous variables. For a given level of dispersion in the firms' size distribution, the smaller the median firm the stronger the growth of employment. Results are robust to controlling for the initial level of employment (Table A3.12). Overall, these results suggest that employment is greater when production is made by some large firms associated with many small ones.

Table A3.11: Total Employment – First difference (one year growth / overlapping periods)

Dependent variable: $\Delta \ln(Total\ Employment_{ikt})$				
$\Delta \ln(MeanSize_{ikt})$	0.391a	0.480a		
	(0.06)	(0.05)		
$\Delta \ln(Skewness_{ikt})$	0.488a	0.416a		
	(0.04)	(0.03)		
Interaction term		-0.324a		
		(0.05)		
$\Delta \ln(MedianEmp_{ikt})$			0.074a	0.104a
			(0.03)	(0.02)
$\Delta \ln(StDevEmp_{ikt})$			0.686a	0.680a
			(0.05)	(0.05)
Interaction term				-0.121b
				(0.05)
Nb. Obs.	4405	4405	4409	4409
R^2	0.408	0.484	0.317	0.324

Source: Crozet et al (2013)
Note: OLS with country-industry and year fixed-effects. Robust standard errors are reported in parentheses. Significance levels: a (p < 0,01), b (p < 0,05), c (p < 0.01).

Table A3.12: Robustness check of Table 11. Total Employment – First difference (one year growth / overlapping periods)

Dependent variable: $\Delta \ln(Total\ Employment_{ikt})$		
$\Delta \ln(MeanSize_{ikt})$	0.192a	0.310a
	(0.07)	(0.06)
$\Delta \ln(Skewness_{ikt})$	0.485a	0.377a
	(0.04)	(0.05)
Interaction term		-0.307a
		(0.05)
$\ln(Total\ Employment_{ikt0})$	-0.514a	-0.449a

	(0.05)	(0.04)		
$\Delta \ln(MedianEmp_{ikt})$			-0.058b	-0.038
			(0.03)	(0.03)
$\Delta \ln(StDevEmp_{ikt})$			0.582a	0.579a
			(0.07)	(0.07)
Interaction term				-0.134c
				(0.07)
$\ln(Total\ Employment_{ikt0})$			-0.566a	-0.560a
			(0.05)	(0.05)
Nb. Obs.	1259	1259	1259	1259
R^2	0.669	0.724	0.684	0.687

Source: Crozet et al (2013)
Note: OLS with country-industry and year fixed-effects. Robust standard errors are reported in parentheses. Significance levels: a ($p < 0,01$), b ($p < 0,05$), c ($p < 0.01$).

Total Turnover

We now turn to the growth of total turnover, and look at whether our intuition from the univariate regressions is confirmed here as well. So far evidences have given support to the hypothesis of a market structure where the expansion of large firms and small one is an efficient market structure in promoting employment. In this last section look at whether this market structure is also optimal for the growth of output. Results seem to confirm this hypothesis for the growth of output too. Estimates on the measure of size of our distribution (either by using the average or median size) are not robustly correlated with output growth. What seems to really matter for the growth of output is a more skewed firms' size distribution, associated with smaller firms on average (column 2). In column 4, we find that a larger dispersion of firms is associated with stronger growth of output, and this effect is more pronounced the smaller the median firm becomes: the negative sign of the interaction term indicates that for a given change in the dispersion of the firms' size distribution, output growth is higher when the median firm becomes relatively smaller. Results remain valid when we control for the initial value of output (Table A3.14)

Table A3.13: Total Turnover – First difference (one year growth / overlapping periods)

Dependent variable: $\Delta \ln(Total\ Turnover_{ikt})$				
$\Delta \ln(MeanSize_{ikt})$	0.068c	0.099b		
	(0.04)	(0.05)		
$\Delta \ln(Skewness_{ikt})$	0.275a	0.249a		
	(0.03)	(0.03)		
Interaction term		-0.116b		
		(0.05)		
$\Delta \ln(MedianEmp_{ikt})$			-0.010	0.019
			(0.02)	(0.02)
$\Delta \ln(StDevEmp_{ikt})$			0.282a	0.277a

			(0.04)	(0.04)
Interaction term				-0.119b
				(0.05)
Nb. Obs.	4405	4405	4409	4409
R^2	0.158	0.167	0.132	0.138

Source: Crozet et al (2013)
Note: OLS with country-industry and year fixed-effects. Robust standard errors are reported in parentheses.
Significance levels: a ($p < 0,01$), b ($p < 0,05$), c ($p < 0.01$).

Table A3.14: Robustness check of Table 13. Total Turnover – First difference (one year growth / overlapping periods)

Dependent variable: $\Delta \ln(Total\ Turnover_{ikt})$				
$\Delta \ln(MeanSize_{ikt})$	-0.017	-0.000		
	(0.04)	(0.05)		
$\Delta \ln(Skewness_{ikt})$	0.167a	0.153a		
	(0.04)	(0.04)		
Interaction term		-0.107		
		(0.11)		
$\ln(Total\ Turnover_{ikt0})$	-0.869a	-0.855a		
	(0.08)	(0.07)		
$\Delta \ln(MedianEmp_{ikt})$			-0.068b	0.008
			(0.03)	(0.04)
$\Delta \ln(StDevEmp_{ikt})$			0.184a	0.155a
			(0.05)	(0.05)
Interaction term				-0.276a
				(0.09)
$\ln(Total\ Turnover_{ikt0})$			-0.890a	-0.855a
			(0.07)	(0.08)
Nb. Obs.	1259	1259	1259	1259
R^2	0.717	0.716	0.722	0.736

Source: Crozet et al (2013)
Note: OLS with country-industry and year fixed-effects. Robust standard errors are reported in parentheses. Significance levels: a ($p < 0,01$), b ($p < 0,05$), c ($p < 0.01$).

Results by industry

Total Employment

We now investigate what is happening at the industry level. After all, there is little reason to think every industry is behaving the same and different firms' size distribution can be best for different industries. We split our sample by industry, in order to detect composition effects – due to its disproportionate share in the economy; a single industry could be driving the entire correlations. We report in Table A3.15 the coefficients on $\Delta \ln(\text{MeanSize}_{ikt})$ and $\Delta \ln(\text{Skewness}_{ikt})$, while figure A3.13 displays the results graphically. Figure 13 displays the t-statistics associated with each industry-level regression. t-stats themselves are meaningless, and the relative position of each industry should not be interpreted. They indicate us if the estimated effect is significantly different from zero. It the t-stat is greater than 1.96 in absolute terms, we can be confident at 95% that there is indeed an effect, and that we are not looking at a spurious correlation. The space between the two horizontal lines indicates industries for which the coefficient on $\Delta \ln(\text{MeanSize}_{ikt})$ is not

statistically different from zero (they show the interval [-1.96; 1.96] of the t-statistics inside which coefficients are declared statistically not different from zero at a 95% level of confidence). Coefficients on $\Delta \ln(\text{Skewness}_{ikt})$ are all statistically significant.

A striking result is that in each manufacturing industry, the growth in the skewness of the distribution of employment is associated with a stronger growth of overall employment. Furthermore, Table A3.15 indicates that the coefficients are tightly centered on the mean coefficient. they range from 0.096 (tobacco industry) and 0.206 (motor vehicles) to 0.729 (apparel) and 0.739 (printing). We confirm here that the robust correlation we found so far is not a statistical artifact or is not driven by a very large industry in our sample. In each industry, a stronger skewness is positively correlated with a stronger growth of employment.

Results are not as strong when we look at the growth in average size however. It has already mentioned, and we can now identify industries for which growth in the average size does matter, and industries for which it does not (or is even bad for the growth of employment, as in the Wood industry). In industries in which the growth in the average size of firms is positively correlated with the growth of industry employment, the estimated coefficient ranges from 0.168 (chemicals) and 0.175 (motor vehicles) to 0.757 (tobacco) and 0.942 (Coke and petroleum refining). Overall, out of 26 industries, growth in the size of the average firm is positively correlated with growth of industry employment in 19 industries, not correlated in 6 industries, and negatively correlated in one industry. In figure 13, the 19 industries are in the top-right corner (where both t-stats are greater than 1.96). Overall, these disaggregated industry-level results support our hypothesis of a market structure where few large firms share the market with many small firms as being associated with stronger growth of employment.

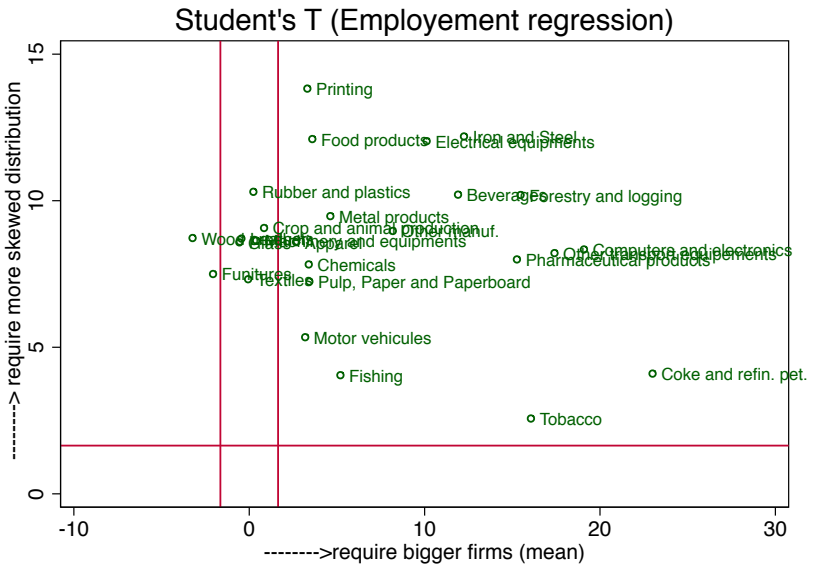
Table A3.15: Results by industry: First difference (2003-2008) - Dependent variable = Total employment, Explanatory variables = average employment and Skewness of employment distribution

		Dependent variable: Total Employment	
Nace Code	Industry	Average size (employment)	Skewness
1	Crop and animal production	0.068	**0.634**
2	Forestry and logging	**0.740**	**0.697**
3	Fishing	**0.410**	**0.253**
10	Food products	**0.245**	**0.640**
11	Beverages	**0.581**	**0.504**
12	Tobacco	**0.757**	**0.096**
13	Textiles	-0.004	**0.340**
14	Apparel	**0.216**	**0.729**
15	Leather	-0.031	**0.543**
16	Wood products	**-0.169**	**0.415**
17	Pulp, Paper and Paperboard	**0.188**	**0.398**
18	Printing	**0.173**	**0.739**
19	Coke and refin. pet.	**0.942**	**0.271**
20	Chemicals	**0.168**	**0.324**

21	Pharmaceutical products	**0.637**	**0.398**
22	Rubber and plastics	0.016	**0.481**
23	Glass	-0.027	**0.305**
24	Iron and Steel	**0.515**	**0.462**
25	Metal products	**0.443**	**0.617**
26	Computers and electronics	**0.695**	**0.486**
27	Electrical equipments	**0.482**	**0.620**
28	Machinery and equipments	0.023	**0.441**
29	Motor vehicle	**0.175**	**0.206**
30	Other transport equipments	**0.740**	**0.476**
31	Furniture	-0.137	**0.375**
32	Other manuf.	**0.378**	**0.554**

Source: Crozet et al (2013)
Note: The table reports the coefficients obtained from equation (1). Bold figures denote coefficients significantly different from zero at a significance level below 10%.

Figure A3.13: t-students / Level regressions (first difference) / Dep. Var. = Mean employment and Skewness



Source: Crozet et al (2013)

Total Turnover

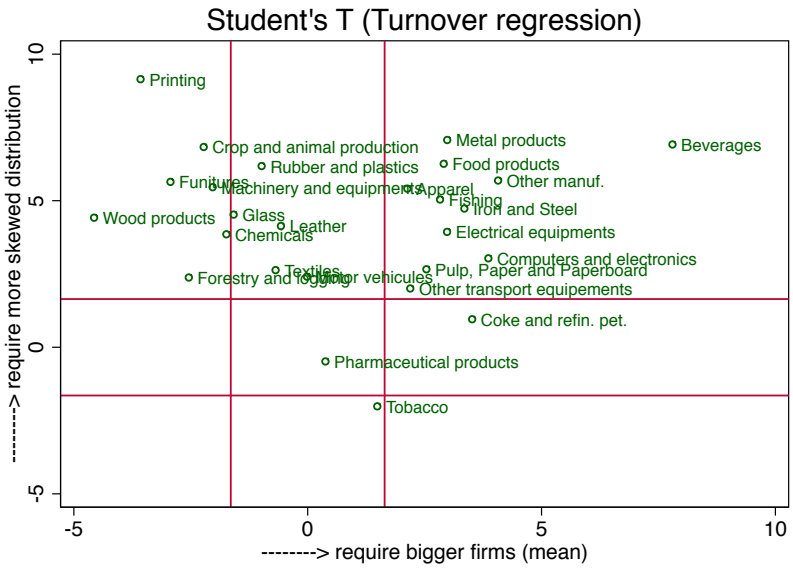
Results by industry using the growth of turnover as dependent variable confirm the previous results obtained when pooling industries together. Figure A3.14 displays the t-stats associated with each coefficient. Again here, a growth in the skewness of the firms' size distribution is strongly correlated with higher growth of output; the only exception being the tobacco and the pharmaceutical industries, with a negative and significant correlation. Focusing on the positive correlations, we do not find evidence of a composition effect between industries: the coefficients on the skewness range from 0.146 (textile industry) to 0.513 (other manufacturing industries).We already saw that the relationship between growth in the average size and growth of turnover was not very robust. We can find here part of the answer: in some industries the correlation is negative and significant (printing: -0.165, machinery and equipment: -0.139), while it is positive in others (beverage: 0.464, Computer and Electronics: 0.206), and insignificant in others (tobacco, textile). To summarize, a larger dispersion in the distribution of firms is almost systematically correlated with a stronger growth of output, while changes in the average size of firms do not produce entirely satisfactory results. In more than half the cases a larger average size is positively correlated with growth of turnover.

Table A3.16: Results by industry: First difference (2003-2008) - Dependent variable = Total turnover, Explanatory variables = average employment and Skewness of employment distribution

Nace Code	Industry	Dependent variable: Total turnover	
		Average size (employment)	Skewness (employment)
1	Crop and animal production	**-0.189**	**0.500**
2	Forestry and logging	**-0.182**	**0.244**
3	Fishing	**0.272**	**0.383**
10	Food products	**0.227**	**0.380**
11	Beverages	**0.464**	**0.416**
12	Tobacco	0.125	**-0.135**
13	Textiles	-0.045	**0.146**
14	Apparel	**0.181**	**0.481**
15	Leather	**-0.049**	**0.317**
16	Wood products	**-0.257**	**0.226**
17	Pulp, Paper and Paperboard	**0.167**	**0.175**
18	Printing	**-0.165**	**0.432**
19	Coke and refin. pet.	**0.529**	**0.232**
20	Chemicals	**-0.107**	**0.198**
21	Pharmaceutical products	0.028	**-0.042**
22	Rubber and plastics	-0.071	**0.312**
23	Glass	-0.088	**0.187**
24	Iron and Steel	**0.269**	**0.343**
25	Metal products	**0.300**	**0.482**
26	Computers and electronics	**0.206**	**0.260**
27	Electrical equipments	**0.189**	**0.270**
28	Machinery and equipments	**-0.139**	**0.322**
29	Motor vehicles	-0.002	**0.166**
30	Other transport equipments	**0.214**	**0.267**
31	Funitures	**-0.195**	**0.284**
32	Other manuf.	**0.275**	**0.513**

Source: Crozet et al (2013)
Note The table reports the coefficients obtained from equation (1). Bold figures denote coefficients significantly different from zero at a significance level below 10%.

Figure A3. 14: t-students / Level regressions (first difference) / Dep. Var. = Mean employment and Skewness



Source: Crozet et al (2013)