

## Firm Productivity Growth

Chapter 2 shows that overall productivity gains resulted mostly from within-sector productivity growth. However, the sectoral analysis hides significant firm dynamism within individual industries.

The Region's impressive productivity gains within sectors largely reflect substantial dynamism within individual firms. The reallocation of workers and firms from less-productive to more-productive activities contributes to industry-level productivity growth in any market economy, but it has assumed a greater role in transition economies given their highly distorted industrial structures inherited from the central planning period. Faced with the radical transformation of the economies, firms in all countries have been forced to adapt their behavior. Some firms have increased productivity through defensive restructuring (through labor shedding), while others have done this through strategic restructuring (the adoption of new technologies). New firms have entered the market, occupying niches that did not exist until recently (services) and displacing obsolete firms that have been forced to leave the market.

The purpose of this chapter is to identify the drivers of productivity growth at the firm level and to shed light on the role of the creative destruction process (usually ascribed to Joseph Schumpeter) in productivity growth in the Region. The element that distinguishes Schumpeter's theory from standard theories of economic growth is that it recognizes firm heterogeneity across industries and

across countries. It also highlights the important role played in productivity growth by the continual changes—entry, exit, expansion, and contraction—in the composition of a population of firms.

Drawing on firm-level data, this chapter also provides fresh insights into the policy drivers of firm productivity growth. The first two sections of the chapter draw on harmonized firm-level data from manufacturing censuses for eight countries in the Region and comparator countries outside the Region (the data have been collected by Eric J. Bartelsman, David J. Brown, John S. Earle, and Stefano Scarpetta). The data permit an examination of the respective roles of the creative destruction process and of productivity gains within firms. The data also permit a study of the evolution of firm demographics over time: rates of the creation and destruction of firms and jobs, the average firm size of entrants, and firm survival rates. In addition to facilitating an understanding of the patterns of firm entry and post-entry performance, firm demographics shed light on the net employment impact resulting from the reallocation process. The last section of the chapter draws on firm-level data included in the Amadeus Database, which contains financial corporate data on more than 60,000 firms in 14 countries in the Region. Amadeus data include details on firm output and factor inputs (material costs, labor data, fixed assets) that allow for the estimation of TFP growth. The last section also draws on enterprise surveys (BEEPS) and international reviews of progress reform indicators (the Doing Business Database, the Economic Freedom of the World Database, and EBRD transition indicators) to shed light on policy and regulatory constraints on good firm performance.

## Firm Dynamics and Productivity Growth

What does the microevidence say about the sources of productivity growth? The nature of efficiency gains within firms? The reallocation of workers to more-productive activities? The entry of new firms and the exit of obsolete ones? Answering these questions requires the decomposition of aggregate productivity growth into five components, as follows:

- The *within component*, which accounts for the productivity growth that takes place *within* firms; productivity growth within firms depends on changes in the efficiency and intensity with which inputs are used in production.
- The *between and cross components*, which capture the role of labor reallocation *across* existing firms in aggregate productivity growth. The

between component reflects gains that arise from high-productivity firms that are gaining market share or from low-productivity firms that are losing market share. The cross component reflects increases in aggregate productivity that arise from firms exhibiting high productivity growth that are gaining market share (or from firms exhibiting low productivity growth that are losing market share).

- The *entry and exit components*, which reflect the gains arising from the creation of new firms and the exit of obsolete firms. This is sometimes aggregated into a single component, net entry, which captures the aggregate effect of firm churning (or firm turnover) in total productivity growth.

Aggregate productivity growth may be decomposed in a variety of ways. The decompositions reported in this chapter adopt the approach developed by Foster, Haltiwanger, and Krizan (2001). Box 3.1 and appendix 3.A provide additional details on data sources and methodology. This decomposition may be applied to both labor productivity

### BOX 3.1

#### The Decomposition of Productivity Growth Using Firm-Level Data

Using productivity at the firm level and production factors as building blocks, one may decompose productivity for each industry into the contributions of continuing firms, new entrants, and exiting firms. One defines the sectorwide productivity level in year  $t$ ,  $P_t$ , as

$$P_t = \sum_i \theta_{it} p_{it}$$

where  $\theta_i$  is the employment share of firm  $i$ , and  $P_t$  and  $p_{it}$  are a productivity measure (in this analysis, labor productivity).

We focus on a common method for decomposing productivity growth. The Foster-Haltiwanger-Krizan method (2001) breaks aggregate productivity growth into five components, commonly called the within effect, the between effect, the cross effect, the entry effect, and the exit effect, as follows:

$$\begin{aligned} \Delta P_t = & \sum_{i \in C} \theta_{it-k} \Delta p_{it} + \sum_{i \in C} \Delta \theta_{it} (p_{it-k} - P_{t-k}) + \sum_{i \in C} \Delta \theta_{it} \Delta p_{it} \\ & + \sum_{i \in N} \theta_{it} (p_{it} - P_{t-k}) - \sum_{i \in X} \theta_{it-k} (p_{it-k} - P_{t-k}) \end{aligned}$$

(Continues on the following page.)

## BOX 3.1

**The Decomposition of Productivity Growth Using Firm-Level Data (*continued*)**

where  $\Delta$  is changes over the  $k$ -year interval between the first year ( $t-k$ ) and the last year ( $t$ );  $\theta_{it}$  is the share of industry employment in firm  $i$ ;  $C$ ,  $N$ , and  $X$  are sets of continuing, entering, and exiting firms, respectively; and  $P_{t-k}$  is the aggregate (that is, the weighted average) productivity level of the sector at the first year ( $t-k$ ).

The components of the Foster-Haltiwanger-Krizan decomposition are defined as follows:

- The within-firm effect is within-firm productivity growth weighted by initial output shares.
- The between-firm effect captures the gains in aggregate productivity arising from the expanding market of high-productivity firms or from the shrinking shares of low-productivity firms weighted by the initial shares.
- The cross effect reflects gains in productivity from the expanding shares of high-productivity-growth firms or from the shrinking shares of low-productivity-growth firms. The term is positive if the firms that are gaining market shares are also those with above-average productivity growth; it is negative if the firms that are downsizing are the more productive ones.
- The entry effect is the sum of the differences between each entering firm's productivity and the initial productivity in the industry weighted by the market share of each entering firm.
- The exit effect is the sum of the differences between each exiting firm's productivity and the initial productivity in the industry weighted by the market share of each exiting firm.

The Foster-Haltiwanger-Krizan method uses the first year's values for a continuing firm's share ( $\theta_{it-k}$ ), its productivity level ( $p_{it-k}$ ), and the average sectorwide productivity level ( $P_{t-k}$ ). A potential problem with this method is that, in the presence of measurement error in assessing market shares and relative productivity levels in the base year, the correlation between changes in productivity and changes in market share may be spurious, thereby affecting the within- and between-firm effects.

*Source:* Foster and others 2001.

growth and TFP growth over five- or three-year rolling windows for all periods and industries for which data are available.

Most of this chapter relies on decompositions of labor productivity growth, but, whenever possible, it also draws on TFP growth. TFP estimates tend to be less robust than estimates of labor productivity because of the difficulty of measuring the stock of capital at the firm level. Despite this caveat, the decomposition of TFP has the advantage of being a more comprehensive measure of productivity. The decomposition of TFP growth in the Region yields results that are somewhat

different from the results of the decomposition of labor productivity growth. The bulk of TFP growth is also driven by within-firm productivity growth, but the contribution of this term tends to be smaller. The reallocation of labor across existing firms (the between and cross terms) and firm churning (the sum of firm entries and exits) tend to play a more important role. A possible explanation for the discrepancy in the respective roles of within-firm growth and reallocation in labor and TFP growth decompositions may be that incumbent firms have been able to increase labor productivity mainly by substituting capital for labor (capital deepening) or by exiting the market altogether, but not necessarily by improving overall efficiency in production processes. In contrast, new firms entering the market with better combinations of factor inputs and new technologies have generated more rapid TFP growth.

In addition to productivity decompositions, the chapter also reviews firm demographics, focusing on the most easily obtainable statistics, as follows:

- The firm *entry rate* will be calculated as the number of entrants during a certain period, divided by the total number of firms in the sector. Data permitting, the study will also calculate entry penetration rates (where gross sales are used as a measure of the share of entrants) and employment-weighted entry rates.
- The firm *exit rate* will be calculated as the number of exiting firms during a certain period, divided by the total number of firms in the sector. The analogous employment-weighted exit rate will be calculated by dividing the employment levels in existing firms by total employment.
- The firm *turnover rate* is the sum of the entry and exit rates in a given sector over a given period.

To analyze the patterns of exit and survival and of firm growth, several types of regressions will be run that draw on maximum likelihood estimation methods using logit, probit, and tobit functional forms. Explanatory variables will include firm size, age, capital intensity, and ownership structure.

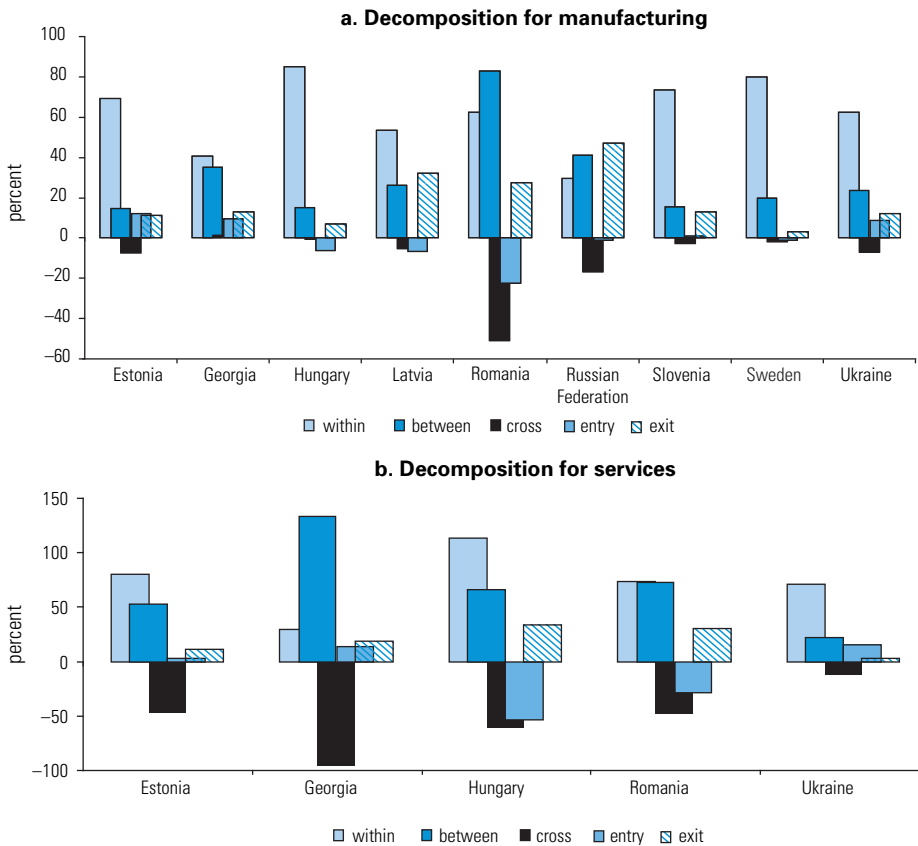
### Sources of Productivity Growth

Three main messages emerge from the decomposition of labor productivity growth that draws on firm-level data for a sample of EU-10, CIS countries, and comparator countries outside the Region (see figure 3.1):

- *Productivity growth within each firm accounts for the bulk of overall labor productivity growth.* This is particularly the case if one focuses on

FIGURE 3.1

### The Sources of Productivity Growth Differ Substantially across Countries and Sectors



Sources: Bartelsman and Scarpetta 2007; Brown and Earle 2007.

Note: For manufacturing, the years are Estonia, 2002–04; Georgia, 2001–04; Hungary, 2000–03; Latvia, 2003–05; Romania, 2002–05; Russian Federation, 2001–04; Slovenia, 2002–04; Sweden, 2002–04; and Ukraine, 2002–05. For services, the years are Estonia, 2002–04; Georgia, 2001–04; Hungary, 2000–03; Latvia, 2003–05; Romania, 2002–05; and Ukraine, 2002–05.

the three-year horizon; over the longer run (that is, the five-year horizon), reallocation and, in particular, the entry component play a stronger role in promoting productivity growth. Even in advanced reformers, the within component, while sizable, contributes less than it does in advanced industrialized countries.

- *The impact on productivity via the reallocation of resources across existing enterprises or through entries and exits varies across countries.* This reallocation plays a significant role in the transition economies, with a particularly large contribution in laggard reformers. At the same time, however, the cross term is negative. This implies that firms experiencing an increase in productivity were also losing employment share (that is, their productivity growth was associated with restructuring and downsizing rather than with expansion).

- *The contribution to overall labor productivity growth of the entry and exit of firms (net entry) is generally positive in most countries, accounting for between 20 and 50 percent of total productivity growth. While the exit effect is always positive (that is, the least productive firms exit the market, thereby helping to raise the productivity average of the firms that survive), the entry contribution tends to be negative in many countries.<sup>1</sup> In the transition economies, in contrast, the entry effect itself is positive and contributes directly about 10 percent to aggregate productivity growth.*

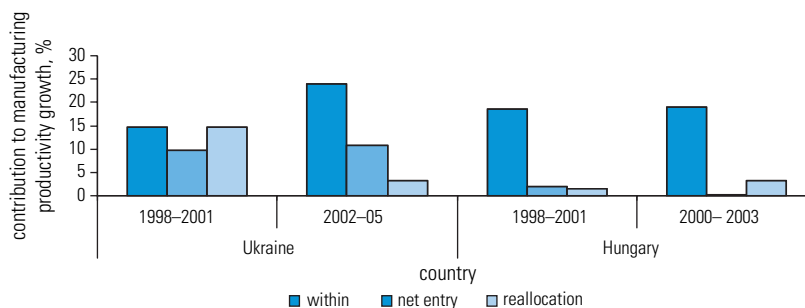
#### *Most Productivity Growth Arises from Efficiency Gains, within Existing Firms*

The bulk of productivity growth arises from efficiency gains within existing businesses (figure 3.2). This is true in healthy market economies, and it is also true in transition economies. But firms improve their productivity in different ways, reflecting variations in the broader country business environment within which they operate. Among slow reformers, within-firm productivity growth is mostly driven by the utilization of excess capacity and by defensive firm restructuring, that is, shedding labor and adopting other cost-cutting strategies. In Russia, available survey data suggest that capacity utilization in manufacturing industries has increased substantially since 1999. In contrast, in advanced reformers, firms improve their productivity through strategic restructuring, which involves investing in new technologies and improving the value added content of products and exports.

Firms located in rapidly reforming regions enjoy higher productivity growth than those located in slowly reforming regions. Firms operating in rapidly reforming regions in Russia and Ukraine show higher productivity growth than those in laggard reforming regions.

**FIGURE 3.2**

#### **Productivity Gains Have Arisen Primarily from Improvements within Firms**



Similarly, firms located in regions with better transport infrastructure tend to show higher productivity growth than those located in regions with greater transport deficiencies.

Large firms show higher productivity growth than small and medium firms; this is mostly driven by large within-firm productivity gains, but the reallocation effects are larger in smaller firms. Higher productivity growth is mostly driven by within-firm improvements, while the reallocation effects tend to be larger in industries dominated by small firms. In addition, within-firm productivity growth provides a relatively bigger contribution among large firms (250 or more employees). Though the between-firm reallocation has substantial productivity effects among large firms, the net entry contribution is often negative in this group. Among small firms (with less than 50 employees) and medium firms (firms with an average 50–249 employees), reallocation plays a more important role than within-firm productivity growth.

New private firms also show higher productivity growth than state-owned firms, and this is mostly driven by reallocation effects. Overall productivity growth is higher within new private firms. Within-firm productivity growth is nearly twice as high in this group of firms relative to old firms in Hungary and Russia, though it is lower in such firms in Romania. Reallocation contributes more among newly private firms relative to state-owned firms in Hungary and Romania, although the opposite is the case in Russia and Ukraine. In the latter two, new private entrants and exiting firms are much less productive than the average relative to their state-owned peers. The reallocation of resources among incumbent firms (the between term) is much greater among private firms in Hungary and Romania than in Russia and Ukraine. These differences are related to the modes of privatization and the degree of market competition (see the next section).

Foreign-owned firms tend to show higher productivity growth than domestic private or state firms. These findings help in addressing the endogeneity problems often found in the link between foreign entry and productivity growth. The analysis is based on time series data that allow firms to be followed before and after they have become foreign-owned. The large productivity growth enjoyed by foreign firms is driven by different factors across countries. In Russia, it is driven by higher within productivity growth. In Hungary, it seems to be related to initial productivity differences at entry.

Firms operating in ICT-related industries display better productivity performance, reflecting the presence of technological spillovers. Firms operating in ICT-related industries rely on strategic restructuring and improve their productivity by adopting new and better ways to produce goods. In contrast, firms in non-ICT industries tend to engage

in defensive restructuring strategies to increase productivity, mostly by shedding labor. Overall, they tend to have lower productivity growth than firms operating in ICT industries. Firm entry also plays an important role in boosting productivity in ICT-related industries, whereas the contribution of new firms to productivity growth is negative in non-ICT-related industries. In other words, in industries with greater opportunities to innovate, a large number of new firms tend to emerge. The better performance of companies operating in ICT-intensive sectors may be considered evidence of the presence of technological spillovers. If a firm operates in a high-technology environment, it is more likely to absorb new developments quickly and to boost productivity additionally.

Likewise, firms in industries that depend on external finance tend to enjoy higher productivity growth, and this is even more the case in countries at higher levels of financial development. Productivity tends to grow more quickly in firms operating in industries that are more dependent on external finance and in countries with deeper financial markets.

#### *Firm Churning Contributed More to Productivity Growth at the Start of Transition*

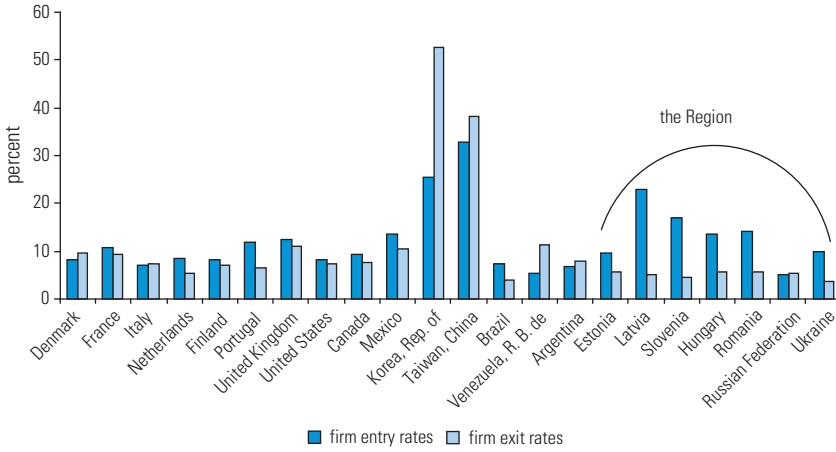
The process of creative destruction encourages firms to experiment and learn; it rewards success, and it punishes failure. Healthy market economies exhibit fairly high rates of firm entry and exit. Around 5 to 20 percent of firms enter or exit the market every year. In the Region, about 20 percent of firms were created or destroyed during the past decade (figure 3.3). At the start of the transition, a large fraction of firms were closed down and replaced by new small ventures. As the transition advanced, net firm flows declined, reaching values fairly close to those observed in other countries.

The amount and timing of firm churning vary across countries and industries. Early reformers, such as Hungary, experienced a short period of large firm flows at the start of the transition process; this was dominated by the entry of firms and was mostly a response to privatization. Over time, the number of firms created or destroyed declined and then stabilized at around the rates observed in healthy market economies. In Russia, in contrast, firm flows have been remarkably low (figure 3.4), and, during the second half of the 1990s, firm exit rates exceeded the new firm entry rates. After the 1998 crisis, this trend was reversed, and the number of new firms exceeded the number of firms being destroyed.

Net entry rates are somewhat higher in services than in manufacturing. Firm turnover rates (especially if they are weighted by

**FIGURE 3.3**

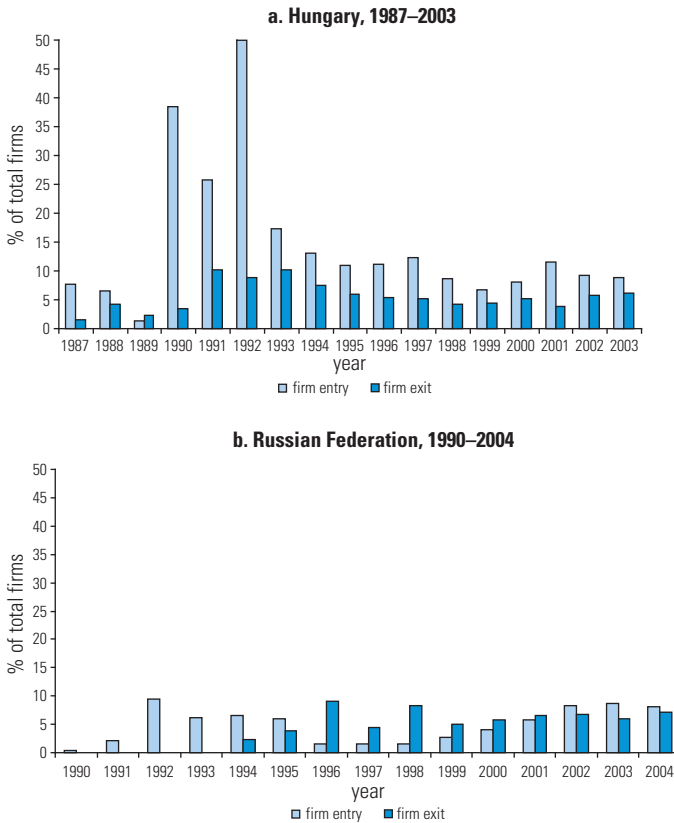
**Firm Start-Ups Have Exceeded Exits in Most Countries over the Past Decade**



Sources: Bartelsman and Scarpetta 2007; Brown and Earle 2007.

**FIGURE 3.4**

**Hungary and the Russian Federation Have Varied in Rates of Firm Churning**



Source: Brown and Earle 2007.

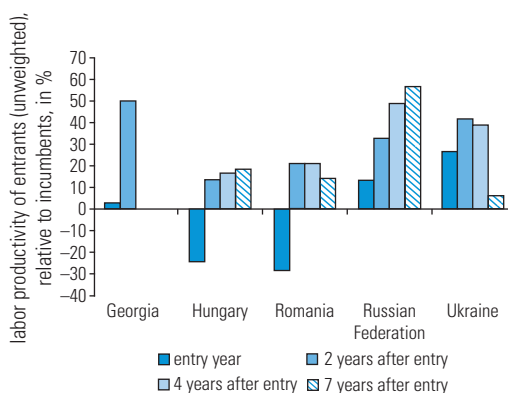
employment) are higher in the service sector (especially in trade) than in manufacturing. In most countries, some high-technology industries exhibiting rapid technological change and market experimentation had relatively high entry rates in the 1990s (for example, office and computing equipment, radio and television, and communications).

The net entry effect (firm entry, plus exit) is generally positive in most transition countries, but its contribution has declined. At the start of the transition, the contribution of net entry was large and accounted for between 20 and 40 percent of total productivity growth. The effect of firm entry also tends to be larger than the effect of firm exit in slow reformers, where low-productivity firms, which are sheltered from competitive pressure, have managed to contain job destruction. This suggests that these firms may still have to undergo a period of downsizing and restructuring.

Entrants tended to show higher productivity, on average, than incumbents during the earlier phases of transition. In Hungary and Romania, entrants were less productive than the average incumbent, which might signal that there was more experimentation. This pattern is similar to the one observed in OECD countries, where entrants often lack experience, and small size often equates with less productivity among new firms. In contrast, in Georgia, Russia, and Ukraine, entrants were (on average) more productive than incumbents (see figure 3.5). They were able to occupy new market niches, mostly in market services, that had been underdeveloped or nonexistent during the central planning period.

Entrants also tended to be small relative to incumbents. Under the centrally planned system, there were relatively few microbusinesses

**FIGURE 3.5**  
**Entrants Showed Higher Productivity than Incumbents**



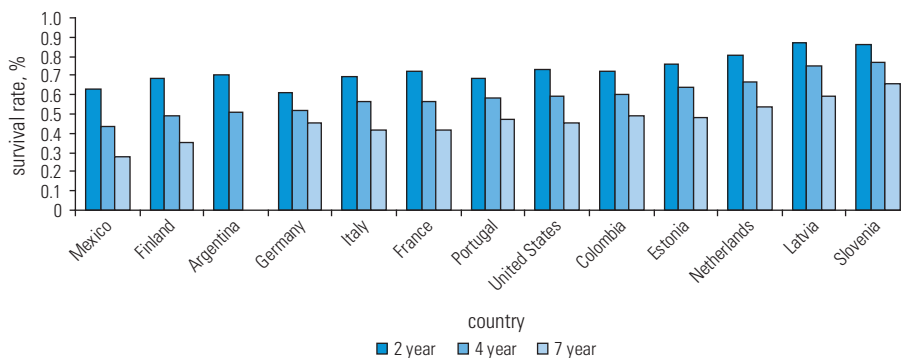
Sources: Brown and Earle 2007.

or small firms, but, after the start of the transition, the number shot up, particularly in business service activities. Many of the entrants that failed during the initial years were also small. The relative productivity of entrants has tended to rise with age.

Entrants tended to show high survival rates at the beginning of the transition. Understanding the post-entry performance of firms sheds light on the selection process in markets, which separates successful entrant firms that survive and prosper from firms that stagnate and eventually exit. Survival rates after entry are higher in Russia and Ukraine. In Estonia, Latvia, and Slovenia, but also in Romania, around 70 percent of the firms survived at least four years (figure 3.6). In contrast, in advanced market economies, firm survival is much lower, pointing toward harsher market selection or to higher variance in quality among entrants. Another possible explanation is that the entrants in the transition economies joined the market with a portion of the pretransition firms intact, that is, the new firms had employees with experience and ongoing connections with customers and suppliers. This latter effect would likely diminish over time.

As countries progress along the transition path, market competition becomes harsher, and survival rates among entrants drop. Entrants show rapidly declining probabilities of survival. In Hungary, around 35 percent of entrant firms in 1991–95 were no longer active in the market after two years, and over 50 percent after four years; only about 35 percent were still in business after seven years. In 1996–2001, survival rates dropped again: 55 percent were no longer active in the market after two years, and over 70 percent after four years; only about

**FIGURE 3.6**  
**Transition Economies Show Higher Survival Rates Than Many Advanced Economies**

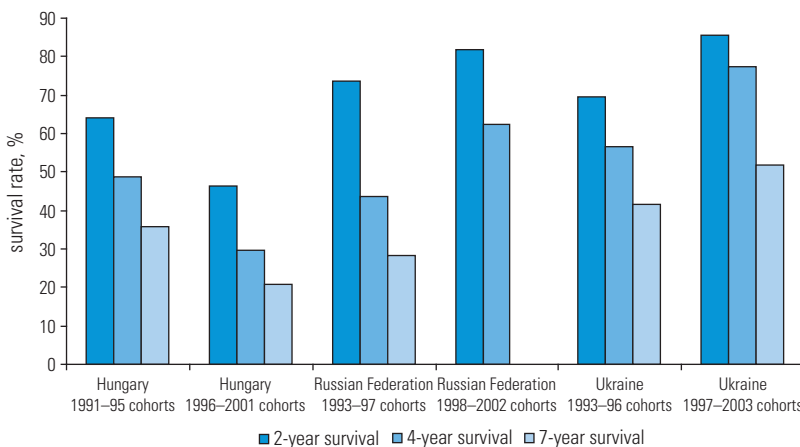


Source: Bartelsman and Scarpetta 2007.

20 percent were still in business after seven years. Opposite trends are found in countries that are relatively behind on the transition path, such as Russia and Ukraine. Survival rates in these late reformers are higher than those in Hungary, and they have increased over time (figure 3.7). In contrast, failure rates among young businesses are high in all market economies, but, in advanced industrial countries, about 40–50 percent of new firms are still in business after seven years. In the Baltic states, entrants face an environment that is slightly less harsh than the one in the EU; about 70 percent were still active after four years, and 50–60 percent survived seven years (figure 3.5).

Even successful entrants have not expanded significantly. Large firms in manufacturing have been affected the most, and the expansion of successful firms has been limited. At the start of the transition, Estonia, Latvia, and Slovenia exhibited substantial declines in firm size, especially in manufacturing, while the size of the largest firms declined post-transition and did not respond noticeably to the opportunities of the enlarged market. In Slovenia, the average size in the quartile of the largest firms had dropped from over 800 to 200 employees by the early 2000s. In the Baltic countries, no sign of any increases in the average size has been evident. The question remains whether firms in these countries are able to benefit fully from the opportunities offered by economic integration in the EU. The lack of growth among large manufacturing firms contrasts with the rapid

**FIGURE 3.7**  
**As the Transition Matures, Markets Grow Harsh, and Entrant Survival Rates Drop**



Source: Brown and Earle 2007.

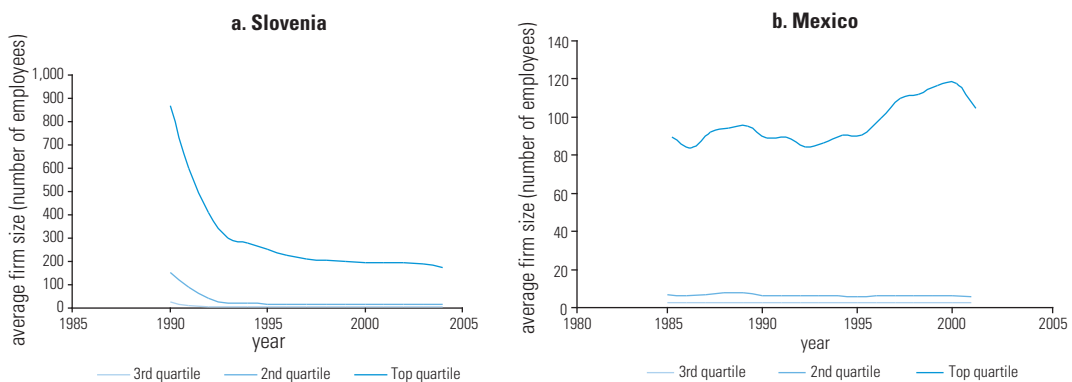
expansion of comparable firms in Mexico in the few years since the establishment of the North American Free Trade Agreement. In Mexico, there has been a rapid expansion in the mean size of the quartile of the largest manufacturing firms from 80 employees to 120 employees per firm (figure 3.8).

*Worker Reallocations from Less- to More-Productive Firms Contributed to Growth*

The reallocation of workers across existing firms also contributed to productivity growth; its role was particularly large at the start of the transition. In countries at the early stages of transition, the between term tended to be large and positive, indicating that firms with higher than average productivity levels were tending to gain market share. At the same time, the contribution to total productivity growth of the cross term (the shift of resources toward firms with higher than average productivity growth) is negative. This means that firms experiencing an increase in productivity were also losing employment shares, that is, their productivity growth was associated with restructuring and downsizing rather than expansion.

The rapid pace of restructuring in transition economies should not yet be taken as evidence of the existence of the same competitive conditions observed in healthy market economies. The pace of firm entry and exit and the contribution of reallocation to productivity growth in mature economies point to an ongoing steady-state process that puts pressure on incumbents to perform well. In early reformers, which are less advanced in the transition process, reallocation is not so much an indicator of the overall state of competitiveness

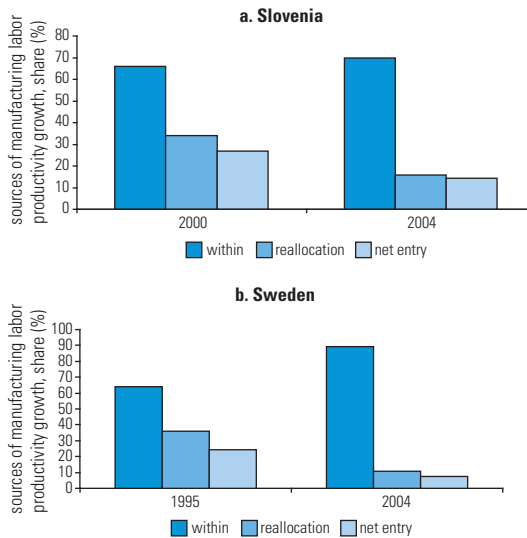
**FIGURE 3.8**  
**Large Manufacturing Firms Are Not Expanding in Slovenia, but They Are in Mexico**



Source: Bartelsman and Scarpetta 2007.

FIGURE 3.9

### Net Entry and Reallocation Are Declining, Converging toward Advanced Market Patterns



Sources: Bartelsman and Scarpetta 2007; Brown and Earle 2007.

of the market, but a reflection of a major change in the supply side of the economy.

As transition matures, the role of net entry and reallocation declines, and the pattern converges toward the patterns observed in advanced market economies. While the relative contributions of reallocation and net entry tend to decline as transition proceeds (figure 3.9), this does not mean that they do not matter in advanced market economies. In advanced industrialized economies, reallocation effects tend to be correlated with business cycles, and, during periods of restructuring, their contribution is greater. Furthermore, as countries move closer to the technological frontier, the role of entry again becomes important in fostering innovation-led productivity gains.

#### *Under Weak Competition, Firm Churning Does Not Pressure Incumbents to Raise Productivity*

The above analysis focuses on the direct contribution of the reallocation process to productivity growth either through the dynamic or the cross-sectional decomposition. But a more rapid pace of firm creation and destruction may also influence the decisions of domestic firms about efficiency-enhancing investment. In particular, the entry of productive firms may increase the contestability of the market, thereby

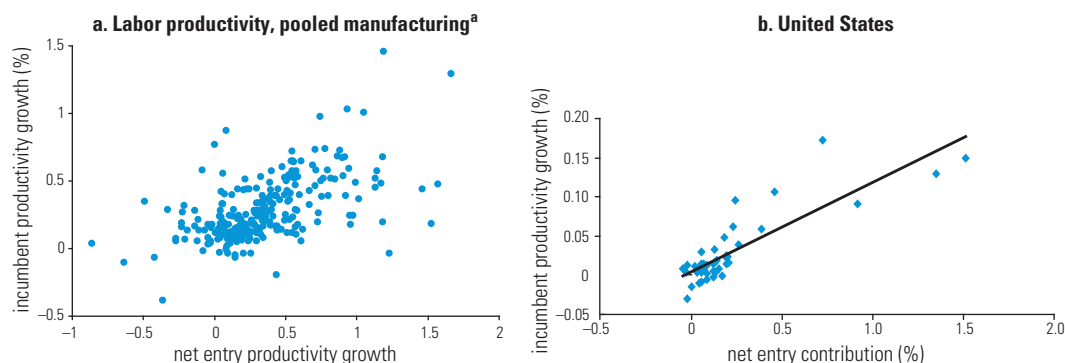
forcing some firms to exit, but also raising the pressure on incumbents to perform more efficiently. There is a strong, positive, and statistically significant correlation between the contribution of net entries and the productivity growth of incumbents in healthy market economies. However, this relationship is weaker in the Region, particularly among the slow reformers, where market competition is also weaker.

Reallocation contributions are often interpreted in the literature as a reflection of the creative destruction process, while within-firm contributions are interpreted as a reflection of more traditional sources of productivity growth (the average firm becomes more productive as advances are achieved in technology). However, rather than alternatives, these effects (within versus reallocation) may be closely related, and the pace of the creative destruction process might be interpreted as a measure of the contestability or competitiveness of markets. Nonetheless, while there is a positive correlation in healthy market economies between the contribution of net entries and the productivity growth of incumbents, this is less clear in the transition economies (figure 3.10).

In the Region, there is a positive correlation between the contribution of net entry and the productivity growth of incumbents in some of the advanced reformers, such as Slovenia. In contrast, in later reformers (Georgia, Russia, and Ukraine), there is no association between the entry of new firms and productivity growth in existing firms (figure 3.11). The lack of pressure from new firms is partly explained by the weaker market competition. It may also be caused by large failure rates among new businesses.

**FIGURE 3.10**

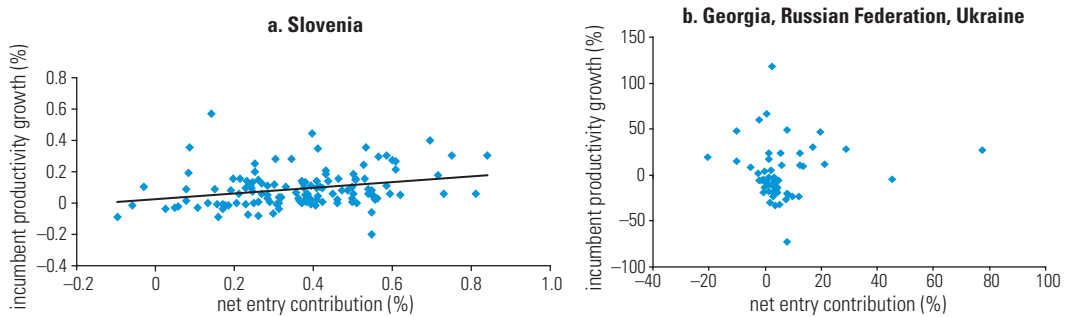
**New Firms Tend to Spur Productivity Growth in Early Reformers**



Source: Bartelsman and Scarpetta 2007.

a. Chart a includes Argentina, Chile, Colombia, Estonia, Finland, France, the Republic of Korea, Latvia, the Netherlands, Portugal, Slovenia, Taiwan (China), the United Kingdom, the United States, and Germany. Outliers are excluded. The chart relies on five-year differencing, real gross output, and country and industry time averages.

FIGURE 3.11

**Entry of New Firms Is Not Always Correlated with Productivity Growth in Existing Firms**

Sources: Bartelsman and Scarpetta 2007; Brown and Earle 2007.

*Even in Early Reformers, Allocative Efficiency Is Less Relative to Healthy Market Economies*

Distortions in market structure and institutions may affect the entry and exit margins in a variety of ways. Early in the transition, resources were locked in firms at lower productivity, on average, but the allocation rapidly improved because of the exit of less-productive firms and the movement of resources toward new more-productive firms. However, even advanced reformers (EU-10) still display lower allocative efficiency than the OECD countries, suggesting that there is room for adjustments (figure 3.12).

## Firm Dynamics and Job Flows

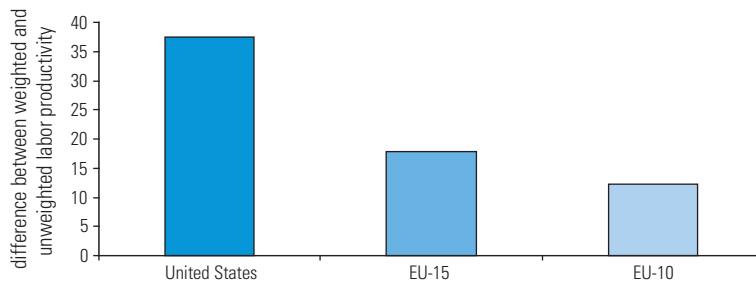
Firm-level data on a sample of countries in the Region and several comparator countries provide insights on the dynamics of the size of firms and the nature of job markets.

### The Transition Led to a Remarkable Surge in Job Flows

At the beginning of the transition, both gross and net firm flows were large compared with the flows in advanced industrial and other emerging economies. In modern economies, gross rates of job creation and destruction range from 5 to 20 percent, representing a total job turnover of up to 40 percent. A significant part of this job turnover (often 30–50 percent) is caused by firm entries and exits.

Job reallocation rates across firms were higher in transition economies relative to advanced market economies. In late reformers,

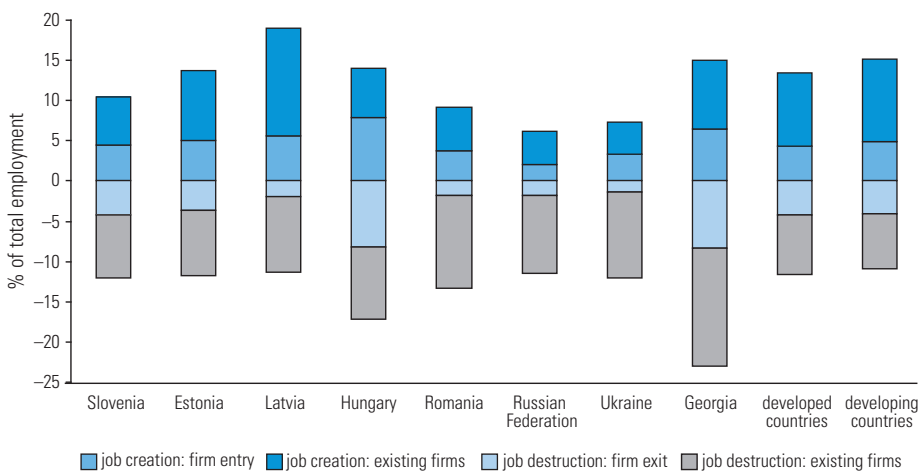
**FIGURE 3.12**  
**Labor Allocative Efficiency in Manufacturing Lags Even in Advanced Reformers**



Source: Bartelsman and Scarpetta 2007.

Note: The figure shows the average Olley-Pakes cross term in manufacturing.

**FIGURE 3.13**  
**Labor Shedding at Existing Firms Was the Main Source of Job Destruction**



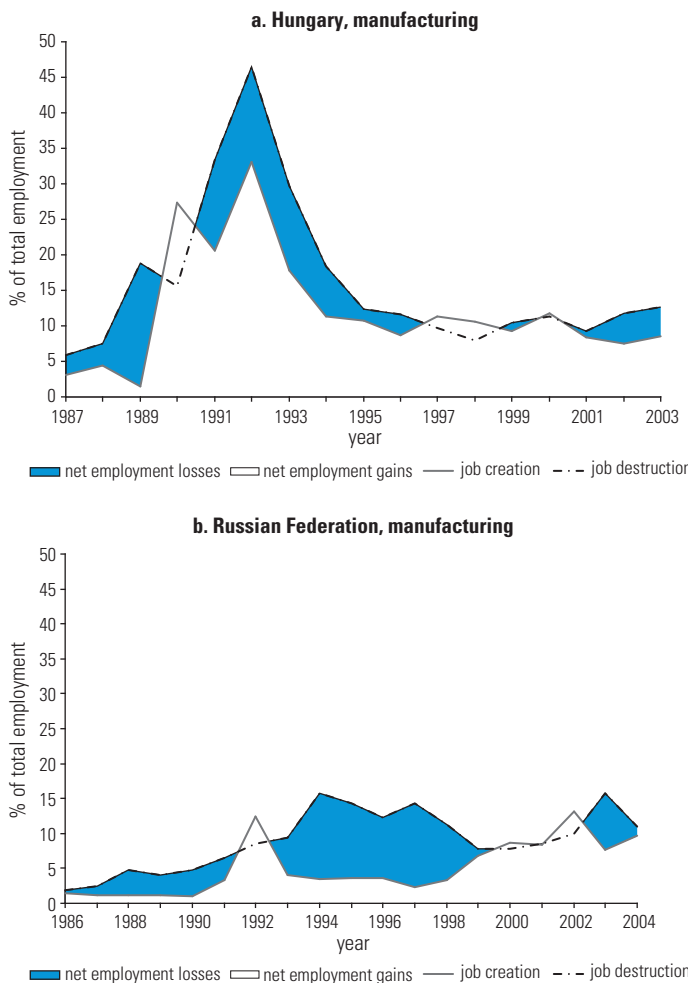
Sources: Bartelsman and Scarpetta 2007; Brown and Earle 2007.

job destruction rates exceeded job creation rates. This was in contrast to early reformers. Unlike entrant firms, existing firms resorted, on average, to defensive restructuring; that is, they improved productivity by downsizing and shedding redundant labor (figure 3.13). At the start of the transition, a large share of firms were closed down and replaced by new small ventures. Firm churning accounted for more than 10 percent of total employment in the Region. As the transition moved forward, net firm flows declined and, by the end of the 1990s, had reached values fairly close to those observed in other countries.

### The Net Employment Impact of Reallocation Varied across Countries and Sectors

In countries lagging in market-oriented reforms, stringent labor market regulations discouraged job creation, and, as a result, job destruction rates exceeded job creation rates. These unsynchronized job flows gave rise to unemployment (or underemployment, that is, low-productive employment in the informal sector). Job destruction generally surged first, but it was the response of job creation that varied across countries: job creation caught up rapidly with job destruction in the early reformers, but job creation did not offset job destruction in the late reformers for any prolonged period (figure 3.14).

**FIGURE 3.14**  
**Sometimes Unsynchronized Job Flows Gave Rise to Net Employment Losses**

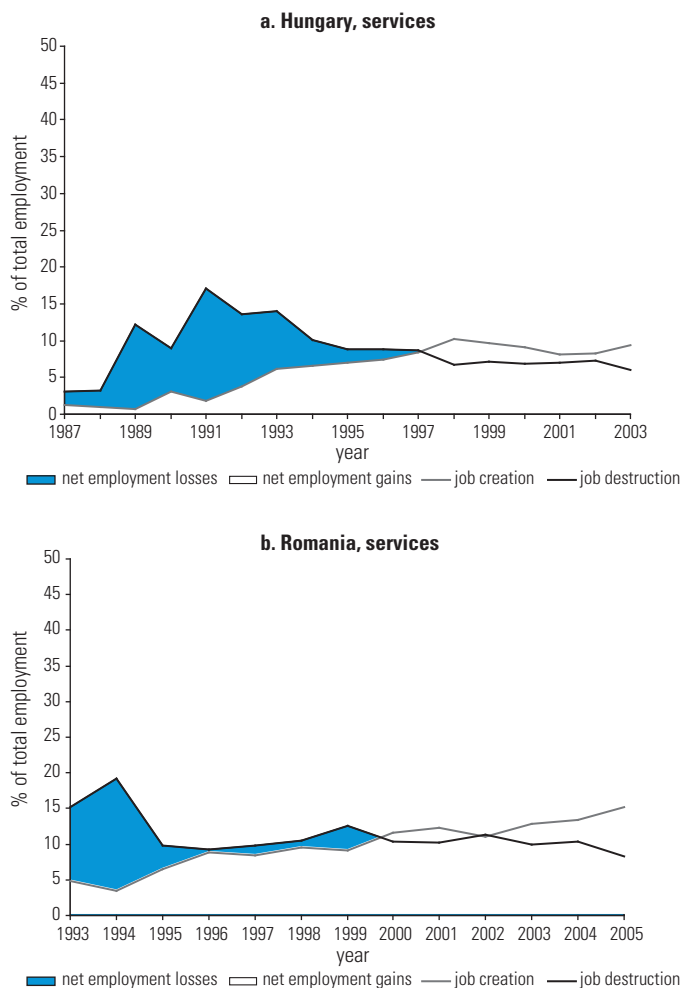


Source: Brown and Earle 2007.

The picture also varied across sectors. Thus, in services, job creation exceeded job destruction in most countries owing to the rapid growth of the sector across the Region (figure 3.15).

Firm entry outpaced firm exit at the start of the transition. During the early stages of the transition, firm entries contributed substantially to job creation (from 25 to 50 percent). New firms not only displaced obsolete incumbents, but also filled market niches that had been either nonexistent or poorly populated until then. Firm exits, in contrast, were not closely associated with job destruction. Most of the job destruction arose because existing firms were following defensive restructuring strategies. Successful entrants that showed higher initial productivity tended to create more jobs (figure 3.16).

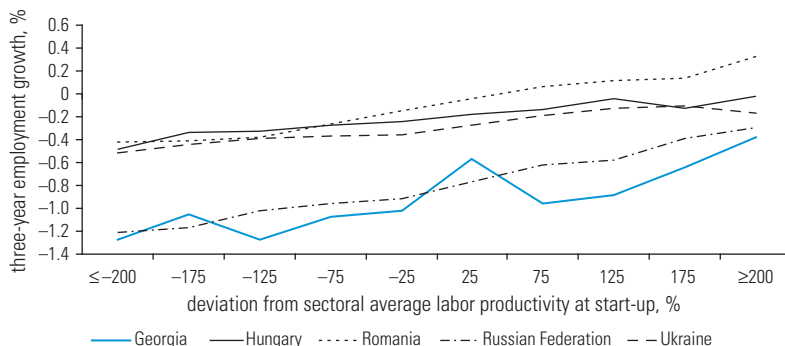
**FIGURE 3.15**  
**Job Creation Exceeded Job Destruction in Services**



Source: Brown and Earle 2007.

FIGURE 3.16

### Firms with Higher Labor Productivity Were More Successful in Creating Jobs



Source: Brown and Earle 2007.

The probability of employment growth was strongly associated with the initial productivity performance of firms.

### Policy Reform Should Focus on Stimulating Productivity

In late reformers, there is still significant misallocation of resources across firms, industries, and locations. This ongoing distortion calls for policy reforms to accelerate the pace of reallocation so that resources may flow from less-productive to more-productive uses. The process of creative destruction (that is, the exit of unprofitable firms and the entry of new, more-productive ones) needs to be invigorated through privatization and stronger market competition.

Although productivity increases are now largely driven by within-firm adjustments, firm entries and exits should play an important role in sustaining productivity growth in the years to come. By continuing to protect ailing firms and to contain firm exit, late reformers have not been able to free resources from less-productive uses to apply them to more-productive uses. Similarly, restrictive product markets and uncertain business environments discourage firm entry and the adoption of available technologies.

In early reformers, the main challenges are the stimulation of innovation within firms and encouragement for the expansion of new, successful firms. These countries also need to focus on reducing any remaining barriers to entry. In this regard, credit constraints, labor market rigidities, and deficiencies in tertiary and vocational education are likely to act as barriers to entry and innovation. Restrictive product, labor, and service markets may deter the entry and growth of new firms and reduce innovative efforts and technology spillovers, and this affects productivity growth negatively.

These findings suggest that policies should focus not only on stimulating productivity growth within existing firms, but also on eliminating barriers to firm entry and exit. The high incidence of failures in Hungary and Romania and the associated job losses are a clear source of concern. While entry for small businesses may be relatively easy, firm survival seems to be more difficult. The findings of sizable labor reallocation across and within sectors and firms suggest that workers have had to adapt to changing demands for labor and skills; this calls for reforms in the education sector. In addition, even though reallocation may enhance productivity in the economy as a whole, there are clearly losers in the process. The losers include the owners of the obsolete businesses and the displaced workers. In economies with less market friction, resources are more quickly reallocated to their best uses and the adjustments take less time. The net employment losses observed in some countries of the Region are the result of policy barriers that slow the pace of the reallocation of resources. The barriers include limited factor mobility (credit market frictions and rigidities in labor markets) and other regulatory constraints affecting firm entry and firm performance. It is, therefore, not surprising to observe that, in these countries, the informal economy still plays an important role as a temporary buffer for creating (less-productive) jobs.

### **Policy Drivers of Firm Productivity Growth**

Chapter 1 presents the outcomes of aggregate cross-country regressions: macroeconomic stability, investments in infrastructure and human capital, improvements in governance, financial sector development, and international integration are all key policy drivers of total productivity growth. This section confirms that most of the policy drivers identified in chapter 1 affect firm productivity growth.

The decisions of firms to improve their productivity are affected not only by their own ideas and capabilities, but also by the incentive framework in which the firms operate: the pressures they face to survive in a competitive marketplace and the opportunities to invest productively, create jobs, and expand. Government policies and institutions exert a strong influence on firm performance through their impact on the costs, risks, and opportunities of doing business. The analysis so far illustrates that the Region's strong productivity performance was, to a large extent, characterized by differences in firm productivity growth rates. Furthermore, those firms that performed well in a particular sector tended to be located in countries that were making the most progress in reforming the policy and regulatory environment.

This section provides empirical evidence of the link between government policies and institutions and firm productivity growth. It confirms the link between policies and productivity growth and sheds light on specific aspects of reform that had a differential impact on productivity growth across countries (see box 3.2).

While it is not possible to disentangle the productivity contribution from all factors affecting firm performance, this chapter argues that part of the rapid increase in firm productivity was driven by higher capacity utilization, sustained macroeconomic stability, investments in

### BOX 3.2

#### **Empirical Analysis of Policy Drivers of Firm Productivity Growth**

The empirical analysis presented in this section draws on two data sets: the Amadeus Database and the BEEPS Database. Amadeus is a comprehensive, pan-European database compiled by Bureau van Dijk that provides firm-level accounting data in a standardized financial format on 24 balance sheet items, 25 profit and loss account items, and 26 financial ratios. It also supplies descriptive information, including trade description codes and activity codes. For the estimation of TFP, this report relies on the May 2006 edition of Amadeus and a sample that covers over 67,000 manufacturing (NACE 15–36) firms in eight countries in the Region (Bulgaria, Croatia, the Czech Republic, Estonia, Poland, Romania, Serbia, and Ukraine) from 1998 through 2004. For the econometric analysis of firm-level TFP growth and the business environment, the final sample for the analysis is limited to a panel of 22,004 firms for which data are available for 2001 through 2004, which corresponds to the 2002 and 2005 rounds of the BEEPS. BEEPS 2002 and 2005 data are assumed to capture the characteristics of the business environment in 2001 and 2003, respectively, and are, therefore, merged with Amadeus 2002 and 2004 observations on country, sector, firm size, and location.

To estimate the impact of the business environment on firm performance, we regress the change in the TFP of manufacturing firms on the lagged changes in several aspects of the business environment as measured by a wide array of BEEPS variables. To mitigate the problems of multicollinearity and endogeneity in the full model regression, we reduce the dimensionality of the BEEPS data using principal component analysis to construct indicators that summarize six distinct dimensions of the business environment: (a) infrastructure quality, (b) financial development, (c) governance, (d) labor market flexibility, (e) labor quality, and (f) competition. Each indicator varies across years and groups of manufacturing establishments of size  $s$ , operating in location  $l$  of country  $c$  at time  $t - 1$ . In addition, changes in the level of competition in each industry  $m$  are measured by the lagged change in the four-firm concentration ratio defined at the 4-digit NACE level and calculated using the full Amadeus sample. Changes in these six business environment indicators are

*(Continues on the following page.)*

## Box 3.2

**Empirical Analysis of Policy Drivers of Firm Productivity Growth  
(continued)**

regressed in the full model, along with changes in firm characteristics and controls for location, industry, and country effects. Formally, the model is specified as follows:

$$\begin{aligned} \Delta \ln TFP_{ijt} = & \alpha + \beta_1 \Delta infrastructure_{t-1}^{s,l,c} + \beta_2 \Delta finance_{t-1}^{s,l,c} \\ & + \beta_3 \Delta governance_{t-1}^{s,l,c} + \beta_4 \Delta labor\_market_{t-1}^{s,l,c} \\ & + \beta_5 \Delta labor\_quality_{t-1}^{s,l,c} + \beta_6 \Delta competition_{t-1}^{m,c} \\ & + \Delta \ln TFP_{i,t-1} + \sum_n \phi_n \Delta Z_{i,t}^n + \sum_m \xi industry_m \\ & + \sum_l \lambda location_l + \sum_c \gamma country_c + \varepsilon_{i,t} \end{aligned}$$

where  $TFP_{i,t}$  is the TFP of manufacturing establishment  $i$ , operating at time  $t$ , and calculated using the semiparametric estimation technique developed by Levinsohn and Petrin (2003);  $\Delta \ln TFP_{i,t-1}$  is the change in the logarithm of TFP from 2001 to 2003;  $\Delta Z_{i,t}^n$  is a vector of changes in firm characteristics that include the number of employees, tangible fixed assets (thousands of 2001 U.S. dollars), and cost of materials (thousands of 2001 U.S. dollars);  $LOCATION$  is a vector of location dummy variables, including a capital-city dummy variable (equal to 1 if the firm is located in a capital city—that is, Belgrade, Bucharest, Kyiv, Prague, Sofia, Tallinn, Warsaw, or Zagreb—and 0 otherwise), and a large-city dummy variable (equal to 1 if the firm is located in a city with a population of 250,000 or more and 0 otherwise);  $INDUSTRY$  is a vector of industry dummy variables defined at the 4-digit NACE level; and  $COUNTRY$  is a vector of country dummy variables for Bulgaria, Croatia, the Czech Republic, Estonia, Poland, Romania, Serbia, and Ukraine.

The results of the regression analysis show that firm-level productivity growth is directly linked to each of these factors in the business environment. Data confirm that good infrastructure, financial development, good governance, and competition encourage firms to operate efficiently and promote productivity growth by lowering risks, costs, and barriers to entry. Conversely, labor market rigidity and a workforce deficient in skills and educational attainment are found to be negatively correlated with productivity growth. All empirical results are statistically significant. In a global economy where technology diffuses rapidly, the persistence of productivity differences across countries may be largely explained by differences in the business environment in which firms operate. These microeconomic foundations—infrastructure quality, financial development, governance, competition, labor market flexibility, and human capital—are critically linked to the success and growth of firms.

A complete description of the data and estimation methodology is presented in appendix 3.B.

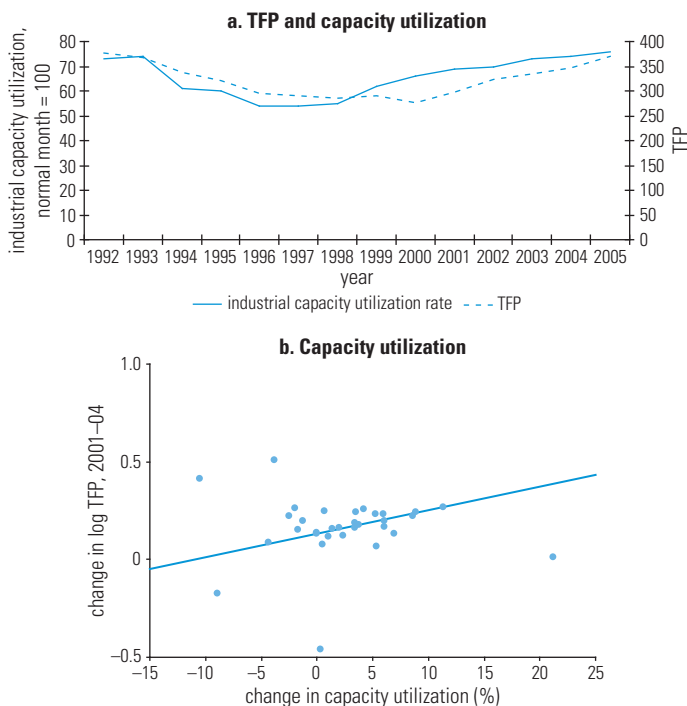
human and physical infrastructure, stronger market competition driven by large-scale privatization, improvements in labor and financial markets, technology transfers through trade and foreign investment, and investments in R&D and new information technologies.

### Improving Capacity Utilization

Chapter 1 indicates that capacity utilization contributed to TFP growth rates in Russia. In transition economies that experienced a strong growth rebound after a deep transitional recession, especially the CIS economies, it is reasonable to suspect that firms resorted to the utilization of idle assets, thereby contributing to a boost in factor productivity growth. In Russia, available firm survey data suggest that capacity utilization in manufacturing industries increased significantly beginning in 1999. In particular, the 2006 Russian Economic Barometer Survey Database suggests that there has been a U-shaped pattern, with capacity utilization falling until the 1998 Russian crisis and rising from 1999 onward (figure 3.17). The use of this productive

**FIGURE 3.17**

### The Recovery in Capacity Utilization Spurred Productivity Growth in the Russian Federation



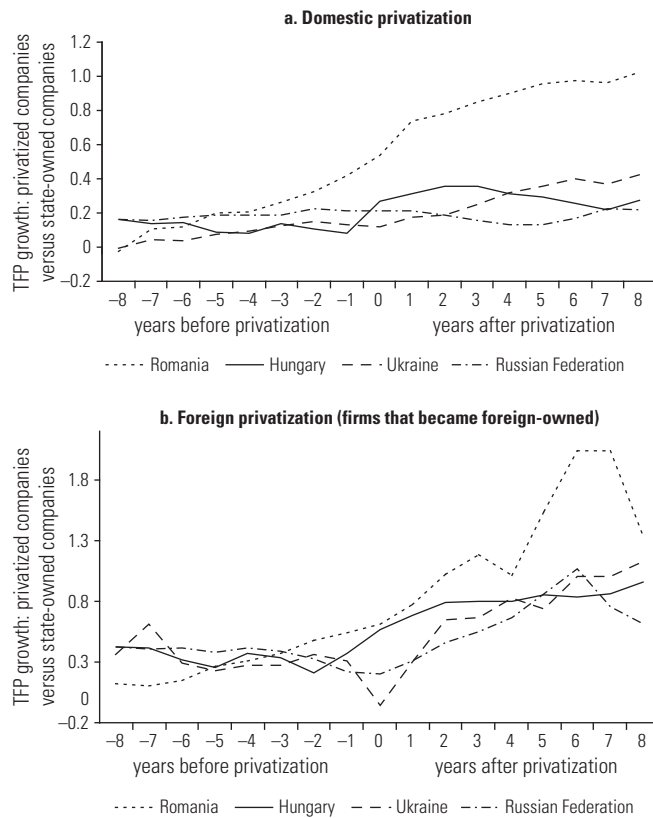
Sources: World Bank staff calculations; Russian Economic Barometer Survey Database 2006; BEEPS 2005; Amadeus Database 2006; appendix 3.B.

capacity was important in the early 2000s but, by 2005, seemed to have run its course.<sup>2</sup>

### Implementing Large-Scale Privatization

The liquidation of inefficient state-owned companies is a phenomenon mostly unique to countries transitioning from a centrally planned to a market economy. Privatization was the main trigger of firm restructuring and productivity growth at the start of the transition. However, the net impact of privatization on productivity growth depended on the type of privatization (Brown and Earle 2007; World Bank 2005a). Transition countries have used different modes of privatization. The privatization methods used in Hungary and Romania resulted in ownership concentration at the time of privatization, while mass privatization in Russia and Ukraine led to dispersed ownership by employees and small investors (figure 3.18).

**FIGURE 3.18**  
**Privatization Raised Productivity Growth, Particularly in Countries that Attracted FDI**



Source: Brown and Earle 2007.

In addition to affecting within-firm productivity growth, privatization also had an impact on the pace of reallocation. Privatization facilitated the process of creative destruction, leading to the emergence of new, more-productive firms and the liquidation or restructuring of obsolete state-owned companies. However, mass privatization, like the surge in capacity utilization, was mostly a one-off event. Further productivity improvements had to be sustained through other policies that aimed at accelerating the pace of reallocation and promoting innovation-led productivity gains within firms.

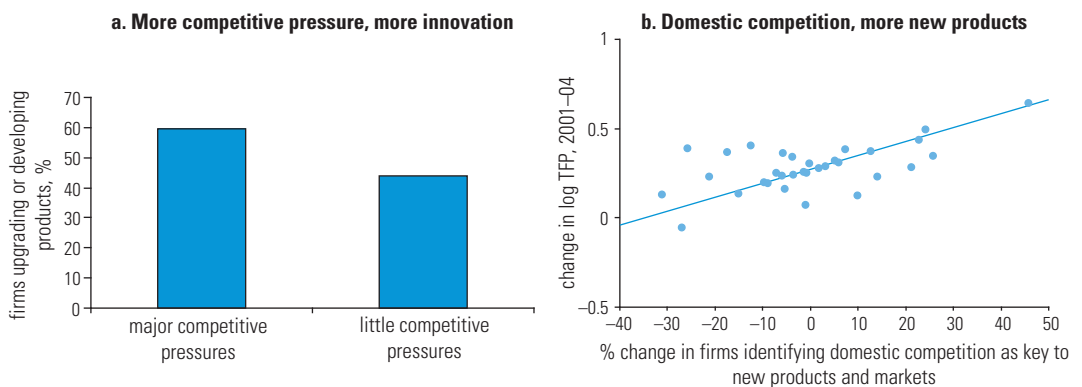
### Strengthening Competition in Product and Service Markets

Firm-level surveys show the importance of competitive pressure as an incentive for firms to innovate and raise productivity (figure 3.19). This is not surprising since various theoretical arguments suggest that greater competition is likely to lead to increases in firm productivity. In weakly competitive markets, firm survival is not immediately threatened by inefficient practices. Managers of existing firms may maintain suboptimal use of factor inputs. In contrast, more-intense competition forces managers to speed up the adoption of new technologies to survive.

#### *Product Market Competition*

The literature has traditionally focused on static measures of product market competition such as market concentration ratios, markups, and import penetration ratios.<sup>3</sup> The market concentration ratio (also known as the Herfindhal index) measures the share of the total output of the largest firms in a market. The markup ratio (also known as

**FIGURE 3.19**  
**Market Competition Fosters Innovation and Productivity Growth**



the Lerner index) captures the degree of monopolistic markup pricing above marginal costs. In practice, because marginal cost is not readily observable, the markup is calculated as the value of sales, less payroll and material costs, divided by the value of sales. The import penetration ratio (the ratio of imports to domestic production) captures the degree of foreign competition.

Empirical evidence drawing on a sample of countries in the Region confirms that firm productivity growth is associated with market competition. The analysis starts by using these traditional indicators of product competition. It reveals that stronger competition in upstream industries is associated with higher firm productivity growth in downstream manufacturing industries. While these indicators are easy to calculate, they fail to provide a direct link to policy or regulation, making it difficult to draw policy conclusions. The empirical analysis in this report has also drawn on the role of product market regulations (proxied by the OECD index) in firm productivity growth in two countries in the Region, the Czech Republic and Poland, during 2000–04. The empirical results show a negative direct effect of the stringency of product market regulations on firm productivity growth. In both countries, product market regulations have been relaxed over the last few years, and this has been reflected in higher firm productivity growth. A recent OECD study also demonstrates that strict product market regulations have a particularly detrimental effect on productivity the more distant the country is from the technological frontier, possibly because the regulations reduce the scope for knowledge spillovers (OECD 2004).

The positive impact of competition-enhancing policies cannot be fully appreciated through measures of static efficiency gains in the short run. Competition has pervasive and long-lasting effects on economic performance by influencing the incentive structure among economic actors, by encouraging their innovative activities, and by selecting more-efficient actors over less-efficient ones over time. Earlier, we have seen how firm churning and, in particular, the role of new entrants play an important part in firm productivity growth among incumbents. The contribution of new entrants to productivity growth is especially strong in higher-technology sectors. This is consistent with recent empirical findings showing that the link between entry and productivity growth is affected by the relative distance of the industry to the world technological frontier (see box 3.3 and appendix 3.B). This also explains why EU-10 countries that are closer to the technological frontier display a stronger correlation between net firm entry and productivity growth among incumbents than do technologically laggard CIS countries. Dynamic efficiency

**BOX 3.3**

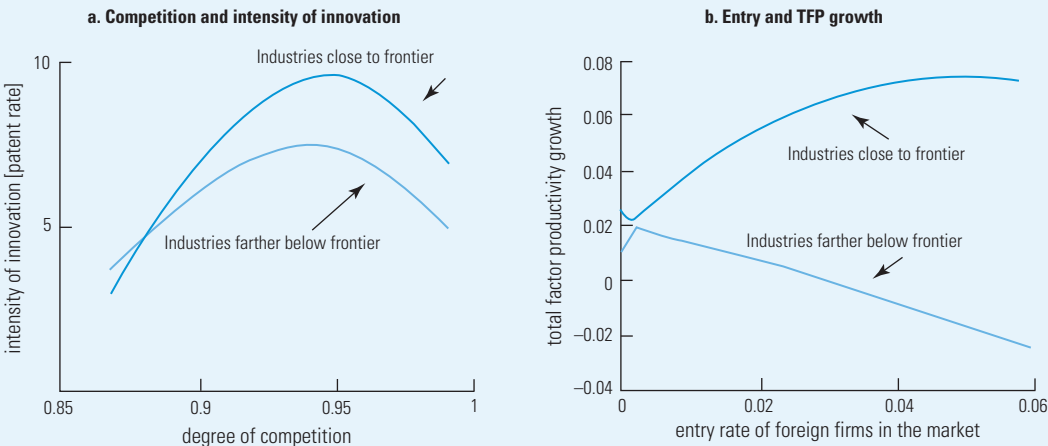
**Competition, Productivity, and Distance to the Technological Frontier**

There is an inverted-U relationship between competition and firm productivity growth. Firms have little incentive to innovate if they are not stimulated by competition, but too much competition may discourage innovation because firms are not able to reap the benefits of their efforts. There is, therefore, an optimal degree of competition.

The costs of weak market competition rise as an economy moves closer to the technological frontier. Aghion et al. (2006) draw on a panel of manufacturing firms in the United Kingdom over 1973–92 to prove this empirically. If we restrict the set of industries to those that are closer to the world technological frontier, the upward sloping part of the inverted-U relationship between competition and innovation is steeper than the shape for the whole sample. Thus, the cost of (in terms of innovation) too little competition grows as the economy develops and moves closer to the frontier.

The entry of foreign firms into the market has a more positive effect on productivity growth in industries that are close to the technological frontier than in those that are not. Similarly, R&D intensity rises as industries approach the technological frontier. Proximity to the technological frontier for an industry in a given country at a given time is defined as the ratio of TFP in that industry and the highest TFP in industry at time among all countries. Proximity varies from zero (for the most inefficient industries) to 1 (for the most efficient).

**Beneficial Effects of Competition and Entry in Industries Near the Technological Frontier**



Sources: Aghion and others 2005, 2006.

gains from product market competition, however, can hardly be achieved without well-functioning service markets.

#### *Competition in Services*

Service liberalization improves the quality and availability of services through competition and economies of scale. The benefits of service liberalization are not limited to the service sectors themselves; they affect all economic activities. In view of the fact that services contribute an average of around 10–20 percent to the production cost of a product and account for all trading costs (transport, trade finance, insurance, communications, and distribution services), the savings arising from stronger competition by foreign providers and from gains in competitiveness in the international markets for services and goods may be substantial indeed.

### **Developing Financial Markets**

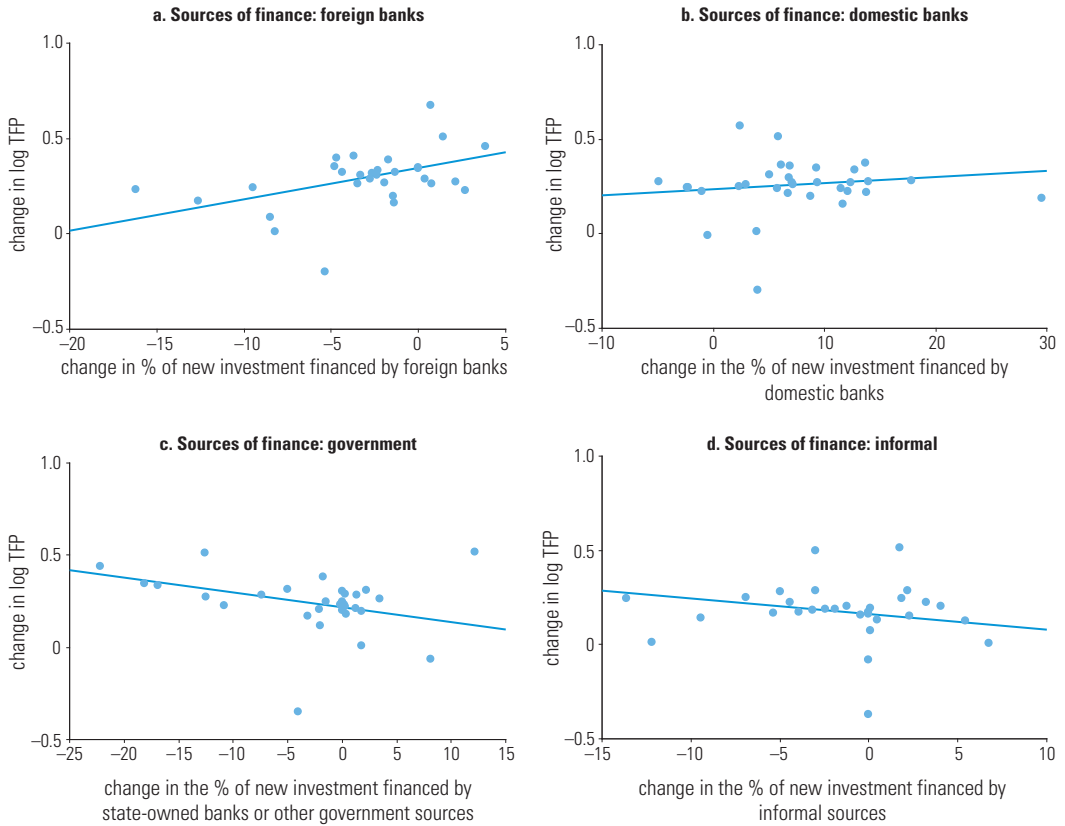
Deeper financial markets provide payment services, mobilize savings, and allocate financing to firms wishing to invest. When these markets work well, they give firms of all types the ability to seize promising investment opportunities. They reduce the reliance of firms on internally generated cash flows and money from informal sources, such as family and friends, giving firms access to external equity and facilitating new entry into product markets. Barriers to the development of the financial sector—such as entry restrictions, restrictions on foreign banks, and the state ownership of banks—hurt the financial system and its ability to increase firm productivity growth.

Empirical analysis indicates that firm productivity growth in the Region is associated with deeper financial markets and better access to credit from foreign and private banks (figure 3.20). But foreign banks might select the most efficient firms. Controlling for this selection bias, we find that firm productivity growth is higher in industries showing heavy dependence on external finance and in countries in which financial sectors are more well developed (see appendix 3.B).

### **Making Labor Markets More Flexible**

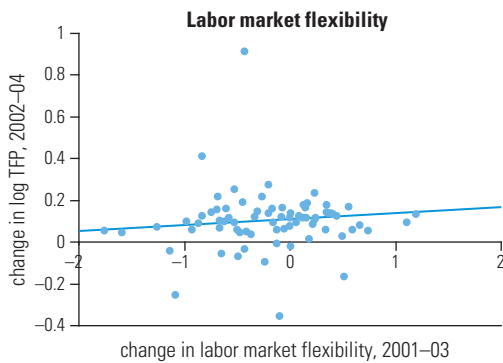
Employment protection legislation may affect firm productivity growth and the pace of the reallocation process. Empirical evidence shows that labor market flexibility is associated with TFP growth (see figure 3.21). Regulation of labor markets is usually intended to help workers, but may also represent a significant constraint on firms. Onerous labor

**FIGURE 3.20**  
**Firms with External or Private Domestic Financing Showed Higher Productivity Growth, 2001–04**



Sources: World Bank staff calculations; BEEPS 2002, 2005; Amadeus Database 2006; appendix 3.B.

**FIGURE 3.21**  
**Labor Market Flexibility Yields Productivity Gains, 2001–04**



market regulations may affect firm productivity growth through their impact on the cost of doing business and the incentive to adopt new technologies. Onerous regulations may also affect the process of creative destruction by influencing the entry of new firms and the flexibility of firms in hiring and firing workers. Onerous employment protection legislation may also discourage job creation because firms will be reluctant to hire workers if they face significant costs in adjusting the workforce to changes in demand.

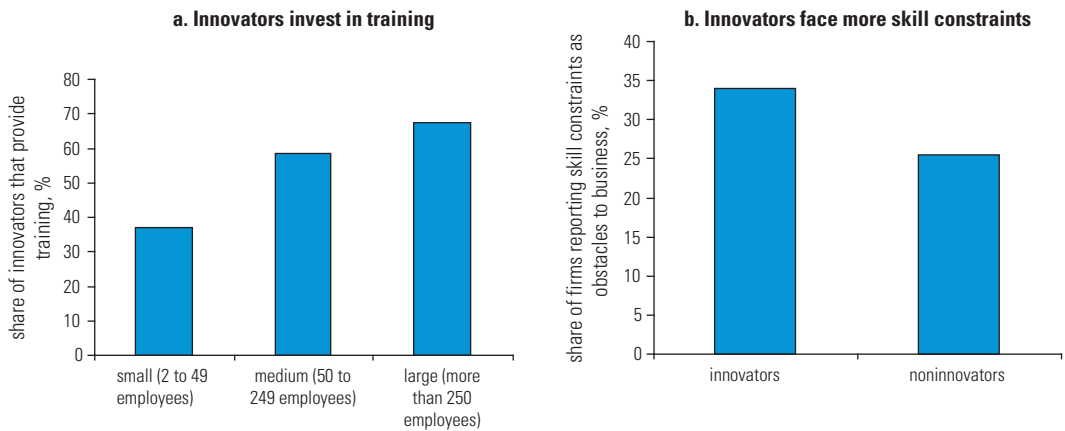
As we see in chapter 2, the protection offered to permanent workers is still stronger in the Region than it is in other regions. However, there is also considerable variation across the Region in the stringency of employment protection, particularly with respect to temporary employment. In laggard reformers (the CIS countries), stringent labor regulations prevented job creation in the formal economy. This meant that job destruction rates exceeded job creation rates and that there was a buildup of a large pool of unemployed or informal workers. In contrast, EU-10 countries moved toward greater flexibility in fixed-term and temporary contracts, increasing the duration of term contracts and expanding the applicability of these contracts. The liberalization of temporary contracts has favored worker mobility and accelerated the reallocation process in the EU-10 (except in Bulgaria and Romania).

### **Investing in Skills**

A skilled workforce is essential if firms are to adopt new and better technologies. Skilled workers are more efficient at dealing with rapid changes and are more flexible in moving across jobs. A skilled workforce is useful for firm productivity growth and for the acceleration of the reallocation process. It provides job seekers with skills that will enable them to find jobs; it also helps employed workers increase their productivity and adapt to new technologies.

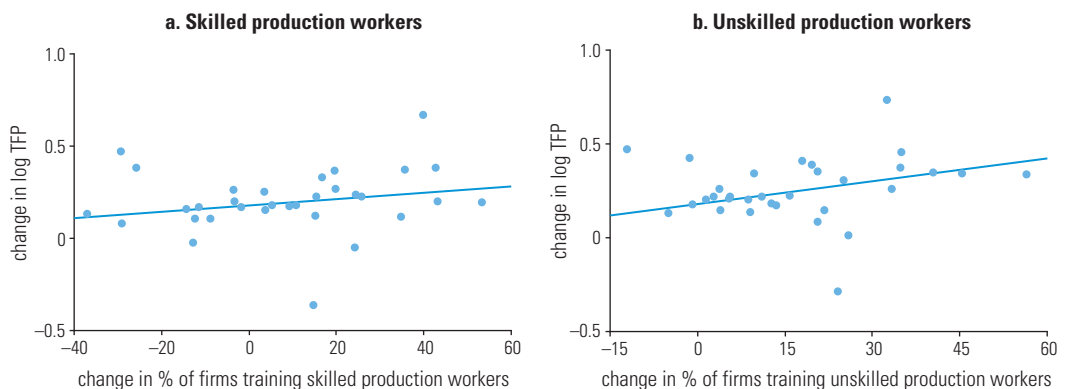
Innovative firms and industries are particularly in need of skilled workers. New technologies generally require significant organizational changes, which are handled more effectively by a skilled workforce. In addition, such firms are also more inclined to invest in training the workforce. While large firms have the capacity to organize internal training for their workers, smaller firms often do not (figure 3.22). Firms in the Region face an increasing shortage of skills. A recent World Bank report shows similar findings, highlighting the shortages in managerial and ICT skills in Russia (Desai and Goldberg 2007). The shortages in Russia seem to originate in deficiencies in higher education and the public research system and

FIGURE 3.22

**Larger Innovative Firms Are More Likely to Provide Training**

Sources: World Bank staff calculations; BEEPS 2005.

FIGURE 3.23

**On-the-Job Training Yields Firm Productivity Gains, 2001–04**

Sources: World Bank staff calculations; BEEPS 2002, 2005; Amadeus Database 2006; appendix 3.B.

underinvestment in ICT training at the firm level, factors which are common to other countries in the Region.

An enhanced supply of more highly skilled workers improves the capacity of firms to innovate. On-the-job training, particularly among unskilled workers, is associated with increases in firm productivity (figure 3.23). Data in the BEEPS Database reveal that firms in the Region are, on average, less likely to offer formal training than are firms in other regions. Controlling for firm characteristics, firms show an average probability of providing formal training at 39.0 percent in the Region compared with 63.6 percent in Latin America. Small firms are less likely to provide training. They may, therefore, be less likely

to grow and become more productive. Similarly, relative to other regions, firms in manufacturing in the Region provide even less training than firms in other sectors. Consistent with what might be expected, firms in high-productivity sectors are more likely to provide training (BEEPS 2005).

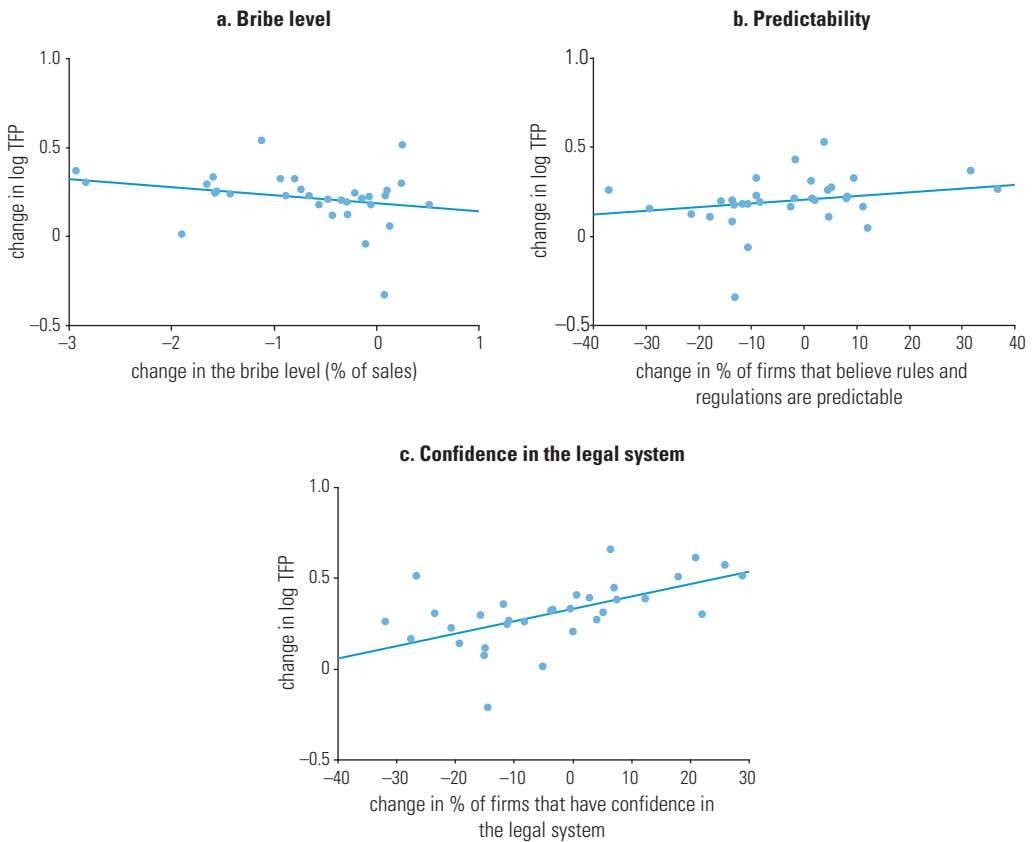
Although training among workers is best provided at the level of the firm, public policies have an important role to play. Training provided by firms includes general and specific components. The first covers skills that are easily transferable to all firms, and the second includes skills that are specific to the firms providing the training (see Becker 1964). Becker's theory suggests that firms will provide training in specific skills from which they may benefit directly at low risk of not reaping the returns, while workers will invest in general skills from which they are the sole beneficiaries. Firms may have difficulty internalizing the returns to training investments because workers may move to other firms. At the same time, the incentives of workers to invest in training may be low if the workers are unable to finance their own training because of credit market inefficiencies. In these cases, government intervention may be needed to complement the efforts of firms in tackling skill imbalances.

But training alone may not suffice to improve the capacity of firms to innovate; skilled employees will still require the help of experts in adopting and improving production processes, in reorganizing company financial systems, and also in adopting new products. Such learning calls for an interaction with knowledge brokers such as consultancies, law firms, accounting firms, business incubators, and technology transfer organizations in universities. Governments may help firms, particularly smaller firms, through matching grants and support for the service providers themselves or through financing for informational mechanisms that allow for more efficient matching of the supply and demand in services.

### **Strengthening Governance**

Firms react to incentives, costs, and constraints. Good governance, which is reflected in accountable and efficient bureaucracies, improves firm productivity by reducing transaction costs. Better governance can improve productivity by lowering the transaction costs for firms in entry, operation, and exit (figure 3.24). It does so by protecting and enforcing property rights, curbing burdensome administrative and judicial rulings, and ensuring good regulatory quality. Better governance also ensures the predictability of rules and

FIGURE 3.24

**Improvements in Governance Were Associated with Higher Firm Productivity, 2001–04**

Sources: World Bank staff calculations; BEEPS 2002, 2005; Amadeus Database 2006; appendix 3.B.

regulations, thereby reducing uncertainty in investment decisions. For example, the impact of a well-functioning court system extends far beyond the number of cases the system resolves. Better courts, by providing timely and predictable rulings, reduce the risks that firms face. Firms with confidence in the courts in Poland, Romania, Russia, the Slovak Republic, and Ukraine are more likely to extend trade credit and enter into new relationships with local firms (Doing Business Database 2007).

Improvements in corporate governance also contribute to firm productivity growth. Privatization in some CIS countries followed methods that kept in power managers with little incentive to innovate, and, because financial discipline was not always in place, these laggard enterprises did not go bankrupt. Low competitive pressure in the domestic market may be a major reason for the observed low levels of innovation and effective technology absorption.

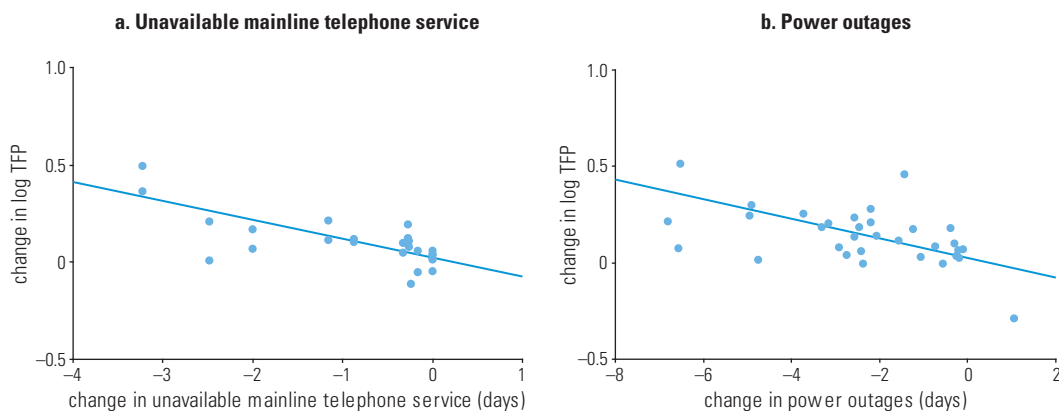
### Improving Infrastructure

Firms in countries with access to modern telecommunications services, reliable electricity supply, and efficient transport links are more productive than firms operating in countries without these advantages. In many countries in the Region, infrastructure deficiencies negatively affect firm productivity growth (figure 3.25). Building and maintaining roads, ports, electricity systems, water supply systems, and telecommunications networks are expensive; so, it is not surprising that poor countries in the Region have worse infrastructure than richer countries. But the challenge of improving infrastructure is not merely one of finding financing. The problem of infrastructure provision in the Region has roots in weak competition, low levels of investments in operations and maintenance, and the inadequate regulatory framework.

### Climbing the Technological Ladder through Trade and Foreign Investment

Trade and foreign investment may help increase firm productivity growth by allowing firms to tap into and benefit from the global pool of knowledge. Most firms in the Region operate in industries and countries that are far from the technological frontier. For these firms, the most cost-effective strategy for technological upgrading is to tap into technologies developed elsewhere. Imported capital goods and technological inputs may directly improve firm productivity by being used in production processes. Alternatively, firms may learn about

**FIGURE 3.25**  
**Infrastructure Quality Was Important to Firm Productivity Growth, 2001–04**



Sources: World Bank staff calculations; BEEPS 2002, 2005; Amadeus Database 2006; appendix 3.B.

technologies by exporting to knowledgeable buyers who share product designs and production techniques. Another channel is FDI. Multi-national firms generally transfer technological information to their subsidiaries, directly affecting the productivity of these firms. Through trade and FDI, technology may diffuse from firms that have acquired it internationally to other firms in the same industries through demonstration effects, labor turnover, or mutual input suppliers (Hoekman and Javorcik 2006).

#### *Trade and Firm Productivity*

Trade may contribute to firm productivity directly through improved access to technologies and indirectly through strengthened competitive pressures.

*Improving access to new technologies through imports.* Imports may provide local firms with access to the new technologies embodied in imported machinery and equipment. Barba Navaretti, Schiff, and Soloaga (2006) find that imported technologies have a positive impact on firm productivity growth in the EU-10. In particular, they find that productivity growth in manufacturing firms depends mostly on the types of imported machinery (quality) and less on the share of imported equipment in total equipment (quantity).

*Improving access to new technologies through exports.* The literature suggests that there are two possible explanations for the high productivity of exporters. One is that exporting directly improves the productivity of the firms doing it (the learning-by-exporting hypothesis). Exporting exposes firms to foreign technologies and modes of production. Trading with countries that have a richer R&D stock or, more broadly, that are able to export more advanced technology goods may have positive spillovers in the form of learning. In addition, exporting allows firms to achieve greater economies of scale by expanding the potential market of the firms. The second explanation is that, because firms must be efficient to compete in international markets, only firms that are already efficient are able to export (the self-selection hypothesis). The empirical evidence on whether firms learn from exporting is mixed.<sup>4</sup> The two hypotheses are not mutually exclusive. Even if efficient firms are more likely to start exporting, it does not rule out the possibility that exporting might help them increase their productivity additionally. Hallward-Driemeier, Iarossi, and Sokoloff (2002) show that firms make deliberate decisions to raise productivity to serve export markets. It is not simply that more-productive firms self-select into exporting, but that firms that target export markets consistently make different decisions on investment, training, and the choice of technology, thereby raising their productivity.

The incorporation of domestic firms into international supply networks (both producer and buyer networks) may also enhance the absorption of new technology. Trading in parts and components with foreign companies that are already well integrated in the global production network may facilitate the acquisition of new technology through vertical spillovers. Empirical analyses conducted for this report confirm that these channels play a significant role in the Region: firms operating in industries that are more integrated into international supply networks display higher productivity growth (see appendix 3.B).

*Enhancing competitive pressures and incentives for local firms to innovate.* Import penetration may also exert competitive pressures on domestic firms operating in the same industry. The greater the export intensity of a firm, the greater the pressures to innovate and improve productivity. Firm-level studies find that trade liberalization improves productivity among firms competing with imports. In Colombia, a 10 percent decline in tariffs was associated with a 3 percent increase in firm productivity in import-competing sectors. Trade liberalization contributes directly to aggregate productivity growth through its impact on within-firm productivity growth, but also indirectly through its impact on the process of reallocation through the exit of inefficient firms, the entry of new firms, and the reallocation of workers across firms (Haltiwanger and others 2004). The empirical analysis carried out in this report confirms that import penetration in upstream sectors is associated with higher firm TFP growth in downstream sectors (see appendix 3.B).

#### *FDI and Firm Productivity*

Investments by multinational enterprises may provide domestic firms with access to more efficient technologies. Insofar as the knowledge does not remain restricted to partner firms, FDI may result in technological spillovers by operating through demonstration effects (imitation) and labor turnover. The literature distinguishes between horizontal spillover effects (within an industry) and vertical spillover effects (generated by links in the production or value chain). While the empirical evidence on intraindustry (horizontal) spillovers from FDI is mixed, the evidence on interindustry (vertical) technological transfer from multinational firms has been consistently positive. In principle, vertical spillovers are more likely to occur insofar as multinational enterprises may be expected to take actions to prevent knowledge from leaking to their competitors in the same industry. In contrast, foreign affiliates may have an incentive to reduce sourcing costs by encouraging productivity improvements among local suppliers of inputs and services.

Foreign investments may also have an indirect effect on productivity growth through their impact on net entry. Ayyagari and Kosová (2006) discover evidence of FDI affecting the entry of new firms in the Czech Republic. They find that a larger foreign presence in the Czech Republic stimulates the entry of domestic firms within the same industry, indicating the existence of possible horizontal spillovers from FDI. They also find evidence of significant vertical spillovers across industries: FDI in downstream (upstream) industries spurs entry in upstream (downstream) sectors via the presence of backward (forward) links. The empirical analysis on countries in the Region carried out for this report confirms these findings. The increased foreign presence in Czech and Polish manufacturing and service industries leads to increased firm TFP growth in these industries (see appendix 3.B).

### **Investing in R&D and New Technologies**

While open trade and investment policies may help in attracting and accessing technology, openness alone is not sufficient. Absorptive capacity is important, as is the initial level of technological capacity of domestic firms. Investments in ICT and R&D, if combined with complementary investments in worker skills and public infrastructure, may support the innovation process, which, in turn, may help in raising productivity growth (box 3.4).

The better performance of companies operating in ICT-intensive industries may be considered evidence of the presence of spillover effects. If a firm operates in a high-technology environment, it is more likely to absorb new developments quickly and to boost productivity. More specifically, there is increasing evidence that ICT investments foster important organizational changes within firms, and such changes have an important impact on productivity performance (Black and Lynch 2001). Several studies point to an important link between the use of ICT and the ability of firms to adjust to changing demands and to innovate (Hempell 2005; Greenan and Guellec 1998). Empirical evidence in the Region shows that firms operating in industries that are more closely related to ICT display higher TFP growth (see appendix 3.B).

Another way to climb the technological ladder is to encourage domestic R&D programs. Firms in the Region perform only about 25 percent of the R&D (as a share of GDP) of firms in healthy market economies (World Bank 2006b). The literature on the relationship between R&D and firm productivity is large. The general conclusion is that R&D investments affect firm productivity positively both directly, that is, via the investments of the firms themselves, and

### BOX 3.4

#### Innovation Leads the Catching-Up Process

Following Aghion and others (2006), let us define proximity to the technological frontier for an industry in a given country at a given time as the ratio between the normalized TFP in that industry and the highest TFP in the industry at time among all countries of the sample. Proximity varies from zero (for the most inefficient industries) to 1 (for the most efficient industries). We obtain estimates of the proximity to the frontier, as well as innovation rates (proxied by the BEEPS question about the percentage of firms that “developed successfully a major new product line/service” in the industry) for the years 2001–04.

The table reports the regression results between the speed of technological catching up (increase in the proximity to the frontier) and the number of innovators. All columns show a significant positive correlation between these two measures. These findings are consistent with the literature (Aghion and others 2006), which shows that greater innovation increases the speed of catching up with the technological frontier.

| Regression          | (1)                 | (2)                  |
|---------------------|---------------------|----------------------|
| $\Delta$ Innovation | 0.0006*<br>(0.0003) | 0.0004**<br>(0.0002) |
| Country dummies     | No                  | Yes                  |
| Industry dummies    | No                  | Yes                  |
| Observations        | 68                  | 68                   |
| R-squared           | 0.042               | 0.781                |

Source: Based on Aghion and others 2006.

Note: Innovation is measured as the percentage of firms that have successfully developed a major new product line or service. Standard errors adjusted for clustering on firms are shown in parentheses.

\* Significant at 10 percent. \*\* Significant at 5 percent.

indirectly via spillover effects (O’Mahony and Vecchi 2002). Empirical analysis in the Region shows that increased R&D (financed by the private sector) raises firm productivity growth in industries that are more closely related to ICT (see appendix 3.B).

## Conclusions

In late reformers, there is still a large misallocation of resources across firms, industries, and locations. This ongoing distortion calls for policy reforms to accelerate the pace of reallocation so that resources may flow from less- to more-productive uses. The process of creative destruction (that is, the exit of unprofitable firms and the

entry of new, more productive ones) needs to be invigorated through privatization and stronger market competition.

Although productivity increases are largely driven by within-firm adjustments, firm entry and exit should play an important role in sustaining productivity growth in the years to come. By continuing to protect ailing firms and contain firm exit, the late reformers have not been able to free resources from less-productive uses for more-productive ones. Similarly, restrictive product markets and uncertain business environments discourage firm entry and the adoption of new technologies. To foster labor reallocation across and within sectors and firms, policies need to encourage workers to be adaptable to changing demands for labor and skills and provide for reforms in education.

In early reformers, the main challenges are the stimulation of innovation within firms and encouragement for the expansion of successful firms. These countries also need to focus on reducing any remaining barriers to entry. Credit constraints, labor market rigidities, and deficiencies in tertiary and vocational education are likely to act as barriers to entry and innovation. Restrictive product, labor, and service markets may discourage the entry and growth of new firms and may reduce innovative efforts and technology spillovers, and this will negatively affect productivity growth.

While the entry for small businesses may be relatively easy, firm survival seems to be more difficult. In addition, even though reallocation may be productivity enhancing for the economy as a whole, there are clearly losers in the process. The losers include the owners of the obsolete businesses and the displaced workers. The high incidence of business failures and job losses in some countries, such as Romania, is a cause of concern and calls for policy reforms to improve factor mobility (reducing credit market frictions and rigidities in labor markets) so as to foster firm entry and post-entry firm expansion.

The findings of this chapter suggest that policies should focus on improving the performance of existing firms, but also facilitating the pace of the reallocation process. Countries in the Region need to strengthen competition and new entries on product markets, invest more in skills, develop financial sectors, make labor markets more flexible, and support the adoption of new technologies through trade and FDI. While the evidence presented in this chapter mostly covers the link between government policies and firm productivity growth, one should recognize that these policies may also affect aggregate productivity growth indirectly through their impact on the reallocation of labor toward higher productive activities. For example, by eliminating

subsidies and price controls in previously protected agricultural sectors, trade liberalization may affect the magnitude of the shifts in employment toward higher-productivity industries in manufacturing and services. Greater financial development may also promote the movement of labor toward manufacturing and services by alleviating the liquidity constraints facing entrepreneurs who want to start up businesses. Investments in human capital and infrastructure may play a role in facilitating the sectoral shifts of workers from less- to more-productive activities. Higher skill levels increase the mobility of workers. Increased capital investments are associated with increases in the relative labor productivity of the sector.

## Notes

1. A negative entry effect results if entrants are less productive than average incumbents; this does not necessarily point to a lack of dynamism. In vibrant and technologically advanced sectors, many high-risk entrants may exhibit low average productivity, while market selection weeds out all but the most productive entrant that overtakes the incumbent over time.
2. The utilization of idle capacity was an important driver of firm productivity in Russia, but not the only one. Other factors contributed to the rapid productivity surge in Russia. First, hydrocarbon export prices started to rise substantially after the 1998 collapse. Second, the 1998 crisis itself created conditions that triggered changes in relative prices and a restructuring process (changes in the input-output mix throughout the economy) that also accelerated productivity growth.
3. These traditional measures of product market conditions are used because they are easy to calculate, even though they show various shortcomings. First, they fail to capture the dynamic aspects of competition, such as the roles of future entrants or the implications of market selection effects. Second, recent research indicates that the relationship between these indicators and product market competition is not straightforward. For example, strong competition may weed out the less-productive firms and thereby increase the market share of the more-productive ones. In this case, a higher degree of market concentration would reflect higher—rather than lower—product market competition. In other words, high-productivity firms may gain market shares and enjoy innovation rents in an environment that is still highly competitive. Likewise, low market concentration does not necessarily mean a high degree of competition because less-efficient firms may maintain substantial market share in a protected market, while only the most efficient firms are able to survive under fierce competition.
4. Clerides, Lach, and Tybout (1998) find that the well-documented positive association between exporting and greater productivity is explained by the self-selection of more efficient firms into export markets. These results contrast with other studies that find evidence of learning by exporting (Van Biesebroeck 2005; Kraay 2006).