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The Role of Policy and Institutions for Productivity and Firm Dynamics: Evidence from Micro and Industry Data

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THE ROLE OF POLICY AND INSTITUTIONS FOR PRODUCTIVITY AND FIRM DYNAMICS: EVIDENCE FROM MICRO AND INDUSTRY DATA

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ABSTRACT/RESUMÉ

The role of policy and institutions for productivity and firm dynamics: evidence from micro and industry data

This paper presents empirical evidence on the role that policy and institutional settings in both product and labour market play for productivity and firm dynamics. It exploits a new firm-level database for ten OECD countries and industry-level data for a broader set of countries, together with a set of indicators of regulation and institutional settings in product and labour markets. Aggregate productivity patterns are largely the result of within-firm performance. But, the contribution from firm dynamic processes should not be overlooked, most notably in high-tech industries where new firms tend to play an important role. Industry productivity performance is negatively affected by strict product market regulations, especially if there is a significant technology gap with the technology leader. Likewise, high hiring and firing costs seem to hinder productivity, especially when these costs are not offset by lower wages and/or more internal training. Moreover, burdensome regulations on entrepreneurial activity as well as high costs of adjusting the workforce seem to negatively affect the entry of new small firms. Our data also suggest different features of entrant and exiting firms across countries. In particular, in the U.S., entrant firms tend to be smaller and with lower than average productivity, but those which survive the initial years expand rapidly. By contrast, firms tend to enter with a relatively higher size in Europe but do not expand significantly subsequently.

JEL classification: O12, O57, L50, C33
Keywords: micro and industry data, productivity, firm dynamics, regulations, institutions

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L' impact des politiques économiques et des institutions sur le marche du travail et le marche des biens sur la productivité et la dynamique des entreprises

Ce papier propose une analyse empirique de l' impact des politiques économiques et des institutions sur le marche du travail et le marche des biens sur la productivité et la dynamique des entreprises. Ce travail s' appuie sur une nouvelle base de données d' entreprises pour 10 pays de l' OCDE , sur des données sectorielles pour un groupe plus large de pays, ainsi que sur un ensemble d' indicateurs de réglementations et de caractéristiques institutionnelles. L'évolution de la productivité s' explique largement par les performances intra-entreprises. Toutefois, la contribution des processus de démographie des entreprises ne doivent pas être négliges. Plus particulièrement, les nouvelles entreprises tendent a avoir un rôle important dans les secteurs des nouvelles technologies. De fortes réglementations sur le marche des biens ont un impact négatif sur la productivité des entreprises ; cela est d'autant plus le cas qu' il existe un écart technologique important avec le leader technologique. De même, des coûts de licenciements ou d'embauche élevés tendent a réduire la productivité, en particulier quand ces coûts ne sont pas compense par des salaires plus bas et/ou par la formation interne a l'entreprise. De plus, le poids des réglementation affectant l'activité entrepreneuriale ainsi que les coûts d'ajustement de l'emploi semblent avoir un impact négatif sur l'entrée de nouvelles petites entreprises. L' analyse des données micro suggèrent aussi des schémas de démographie d' entreprises différents selon les pays. Ainsi, aux États-Unis, les nouvelles entreprises ont tendance a être plus petites et ont une productivité plus faible que la moyenne, tandis que les entreprises ayant survécu les premières années se développent plus rapidement. Au contraire, les nouvelles entreprises ont une taille initiale relativement plus élevée en Europe mais ne croissent pas de façon significative ensuite.

Classification JEL: O12, O57, L50, C33
Mots-Clés: données micro et sectorielles, productivité, démographie d'entreprises, réglementation, institutions

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THE ROLE OF POLICY AND INSTITUTIONS FOR PRODUCTIVITY AND FIRM DYNAMICS: EVIDENCE FROM MICRO AND INDUSTRY DATA SUMMARY AND CONCLUSIONS

Stefano Scarpetta, Philip Hemmings, Thierry Tressel and Jaejoon Woo[1]

1. From an accounting point of view, two main factors seem to have played an important role in explaining the growing disparities in growth paths across the OECD countries over the past decade: differences in productivity patterns of certain high-tech industries; and differences in the pace of adoption of the new information and communication technology (ICT) (see Scarpetta et al., 2000). These two facts, in turns, raise the question as to why OECD countries -- that have access to common technologies and strong trade and investment links -- differ in their ability to innovate and adopt new technologies. This paper looks at the possible role of regulations and institutional settings, in both product and labour markets, in explaining this phenomenon. Product market regulations may contribute to both innovation and adoption by creating different conditions for the birth and expansion of innovative firms as well as for the exit of obsolete ones. Likewise, policy and institutions in the labour market may affect the costs of adjustment associated with the shift to a new technology, as well as the returns to innovation activity.

2. The paper comprises two main sections. Section 1 presents a number of stylised facts from firm-level data. It starts by reporting evidence on productivity effects generated by the expansion and contraction of existing units, as well as by the entry and exit of firms. A decomposition of productivity growth is performed for different manufacturing industries, as well as for some service sectors. The Section then investigates further the process of firm dynamics -- entry, exit and post-entry growth -- in different industries and countries. Section 2 sheds some light on how policy and institutions influence firm and industry performance. First, it assesses whether policy settings in product and labour markets help to explain the observed differences in firm entry rates. Second, it presents industry-level productivity regressions that include policy variables for a wide set of OECD countries.

Summary of empirical results

3. The main results of the firm-level analysis, which is based on data from the late-1980s to the mid-1990s, can be summarised as follows:

- *A large fraction of aggregate labour productivity growth is driven by what happens in each individual firm*, whilst shifts in market shares from low to high productivity firms seem to play only a modest role. Within-firm productivity growth also drives fluctuations in productivity growth over the business cycle, while reallocation tends to be a more stable component.

- *Labour productivity growth is also enhanced by the exit of low productivity units*, especially in mature industries. In other industries -- in particular those experiencing rapid technological

1 . Stefano Scarpetta, Philip Hemmings and Jaejoon Woo work in the Economics Department of the OECD; Thierry Tressel works at the IMF, and was a consultant to the OECD when this paper was written. The authors wish to thank Andrea Bassanini, Jorgen Elmeskov, Mike Feiner, Willi Leibfritz, Giuseppe Nicoletti and Ignazio Visco for useful comments on previous drafts of this paper. The opinions expressed in the paper are those of the authors and should not be held to represent those of the OECD or its Member countries.

changes (*e.g.* information and communication technology industries) -- the *entry of new units* is also important in fostering overall labour productivity growth.

- There is also tentative evidence which suggests that *within-firm growth makes a smaller contribution to multifactor productivity growth* -- a proxy for overall efficiency in the production process – compared with its effects on labour productivity growth. This suggests that incumbents often raise labour productivity by increasing capital intensity and/or shedding labour. In contrast, the entry of new firms provides a relatively large contribution to overall multifactor productivity growth, possibly because these firms enter the market with a more "efficient" mix of capital and labour and likely new technologies.

- The analysis of firm dynamics reveals that a large number of firms enter and exit most markets every year. The early years are the most difficult for entrants: 30 to 40 per cent of entering firms do not survive the first two years. And, although failure rates decline with duration, only about 40 to 50 per cent of entering firms in a given year are still in business seven years later.

- *The likelihood of failure amongst young businesses is highly skewed towards small units*, while surviving firms are not only larger, but also tend to grow rapidly. The combined effect of exits being concentrated amongst the smallest units and the growth of survivors makes the average firm size of a given cohort of entrants increase rapidly toward what appears to be the minimum efficient scale for the industry in question.

- Overall, firm-level *evidence suggests a similar degree of firm churning in Europe as in the United States*. The distinguishing features of firms' behaviour in the US markets, compared with their EU counterparts, are: *i*) a smaller (especially relative to industry average) size of entering firms; *ii*) a lower (albeit with greater variability) level of labour productivity of entrants relative to the average incumbent; and *iii*) a much stronger (employment) expansion of successful entrants in the initial years.

4. The econometric evidence suggests a number of ways in which policy and institutions may influence the patterns of productivity and firm dynamics. In particular:

- Evidence suggests that *stringent regulatory settings in the product market have a negative bearing on multifactor productivity*, and (although results are more tentative) on market access by new firms. Likewise, high hiring or firing costs -- when not offset by lower wages or more internal training -- tend to weaken productivity performance. Moreover, these costs tend to discourage the entry of (especially small and medium-sized) firms into most markets.

- The direct burden of strict product market regulations on multifactor productivity seems to be greater the further a given country/industry is from the technology leader. That is, *strict regulation hinders the adoption of existing technologies* in addition to its detrimental effects on innovation itself, possibly by reducing competitive pressures, technology spillovers, or the entry of new high-tech firms.

- *The empirical analysis of entry reveals that product market regulations and employment protection legislation (EPL) have a strong effect on market access of small- and medium-sized firms*. The effect of EPL are not significant for the entry of very small units -- which are often exempted from these regulations. Likewise EPL, as well as product market regulations, do not influence significantly the entry of large units because they play a relatively minor role in the overall entry and post-entry adjustment costs.

Policy considerations

5. The empirical evidence presented in this paper suggests that aggregate productivity patterns depend on a combination of within-firm performance and firm dynamics: the specific contributions of these two factors vary across industries and countries, depending *inter alia* on the "maturity" of each industry and on market and regulatory framework conditions. As far as within-firm performance is concerned, the present results lend support to the idea that strict product market regulations -- as exist in many continental European countries -- may hinder multifactor productivity, especially if there is a significant technology gap with the technology leader.

6. There appears to be relatively straightforward evidence that strict regulations on entrepreneurial activity, and high costs of adjusting the workforce, negatively affect the entry of new (small) firms. However, the link with aggregate performance is less clear-cut in this case, insofar as greater firm dynamics is not univocally associated with stronger productivity performance. Nevertheless, these results offer a consistent interpretation for the observed cross-country differences in firm dynamics, which has some policy implications. In particular, they offer a rationale for the fact that new firms tend to be smaller and with lower-than-average productivity in the United States when compared with most European countries, but, if successful, they also tend to grow much more rapidly. The more market-based financial system may lead to a lower risk aversion to project financing in the United States, with greater financing possibilities for entrepreneurs with small or innovative projects, often characterised by limited cash flows and lack of collateral. Moreover, low administrative costs of start-ups and not unduly strict regulations on labour adjustments in the United States, are likely to stimulate potential entrepreneurs to start on a small scale, test the market and, if successful with their business plan, expand rapidly to reach the minimum efficient scale. In contrast, higher entry and adjustment costs in Europe may stimulate a pre-market selection of business plans with less market experimentation. There is no evidence in the available data that one model dominates the other in terms of aggregate performance. However, in a period (like the present) of rapid diffusion of a new technology (ICT), greater experimentation may allow new ideas and forms of production to emerge more rapidly, thereby leading to a faster process of innovation and technology adoption. This seems to be confirmed by the strong positive contribution made to overall productivity by new firms in ICT-related industries in the sample of OECD countries analysed in this paper.

1. PRODUCTIVITY AND FIRM DYNAMICS: STYLISED FACTS FROM MICRO DATA

1.1 The process of “creative destruction“ and firm dynamics

7. In the recent past, micro-evidence has accumulated to suggest a wide heterogeneity of firms' behaviour in most markets.[2] The distribution of output, employment, investment and productivity across firms and establishments varies widely; even in expanding industries, many firms experience substantial decline, and in contracting industries it is not uncommon to find rapidly expanding units. Likewise, business-cycle upturns and downturns do not necessarily involve a synchronised movement of all, or even most, firms or establishments. The crucial question for policy is whether this heterogeneity is inherent in the way competitive markets operate and evolve over time, or also depends on policy and institutional settings which could be amenable to reforms in the context of a growth-oriented strategy.

8. Economic theory has long recognised the possibility that firms, even in narrowly-defined markets, may have different characteristics and behave differently (see Bartelsman *et al.*, 2002 for more details). Heterogeneity partly reflects certain product market conditions, *e.g.* product differentiation. At the same time, uncertainty about market conditions and profitability may lead firms to make different choices concerning technologies, goods and production facilities. Also, new technologies are often embodied in new capital, the adoption of which requires a retooling process in existing plants adopting these technologies, as well as changing work practices in some cases. Insofar as new firms do not have to go through this process, they may better harness new technologies. Hence, overall growth will be associated with new entrants who displace obsolete establishments, and this process of “creative destruction” also contributes to the observed heterogeneity in firms' performance.

9. Whatever the leading force driving the heterogeneity of firms, the expansion or contraction of existing units, as well as the creation and failure of firms, are all likely to be influenced in different ways by policy and institutional settings in product, labour and financial markets. Moreover, the process of creative destruction imposes costs on all those involved (*e.g.* entrepreneurs, workers, financial institutions), and the magnitude and distribution of these costs amongst different economic agents are both likely to be influenced by policy and institutions. Identifying these influences is, therefore, an important role for firm-level analyses. More generally, knowledge of the determinants of heterogeneity across firms may contribute to the understanding of how the aggregate economy evolves and reacts to exogenous shocks.

10. The analysis of firms' behaviour has often been constrained by the lack of cross-country comparability of the underlying data. While many studies exist for the United States, evidence for most other countries is often scattered and based on different definitions of key concepts or units of measurement (see Caves, 1998 and Ahn, 2001 for surveys). The construction of a consistent international dataset is, therefore, a necessary first step in exploring the mechanisms which shape firms' behaviour and, especially, in assessing whether policy and institutions have a role to play. For example, because it is not *a*

2. For a survey of recent empirical studies see Caves (1998) and Bartelsman and Doms (2000).

priori clear whether a stronger or weaker process of "creative destruction" (or firm churning) is preferable for aggregate performance, cross-country comparisons are indispensable to provide a proper "metric" for evaluating this process and for putting it into a policy and institutional context.

11. The analysis presented in this Section offers a broader and more consistent international comparison than has hitherto been possible, through the use of specially-constructed firm-level data for ten OECD countries (United States, Germany, France, Italy, United Kingdom, Canada, Denmark, Finland, Netherlands and Portugal). These data have been assembled by national experts as part of a two-year project, co-ordinated by the OECD, in which one of the key aims has been to minimise inconsistencies along different dimensions (*e.g.* sectoral breakdown, time horizon, definition of entry and exit, etc.). Notwithstanding the efforts made to harmonise the data, there remain some differences that have to be taken into account in the international comparison presented below (see Box 1). The next two sections use these data to present evidence on: *i*) the role of entry and exit and reallocation amongst existing firms in total productivity growth; and *ii)* firm dynamics.

Box 1. Building up a consistent international dataset: The OECD firm-level study

Sources of data

Firm level data are usually compiled for fiscal and other purposes and, unlike macroeconomic data, there are few internationally agreed definitions and sources, although harmonisation has improved over the years (see Bartelsman *et al.*, 2002 for more details on the OECD firm-level project). The analysis of firm entry and exit for this study is based on business registers (Canada, Denmark, France, Finland, Netherlands, United Kingdom and United States) or social security databases (Germany and Italy). Data for Portugal are drawn from an employee-based register containing information on both establishments and firms. These databases allow firms to be tracked over time because addition or removal of firms from the registers (at least in principle) reflects their actual entry and exit. The decomposition of aggregate productivity growth requires a wider set of variables than is typically available in business registers and these have to be combined with production survey data.

Definition of key concepts

The entry rate is defined as the number of new firms divided by the total number of incumbent and entrant firms in a given year; the exit rate is defined as the number of firms exiting the market in a given year divided by the population of origin, *i.e.* the incumbents in the previous year.

Labour productivity growth is defined as the difference between the rate of growth of output and that of employment including, whenever possible, controls for material inputs. Available data do not allow control for changes in hours worked, nor do they distinguish between part- and full-time employment. Multifactor productivity (MFP) growth is the change in gross output less the share weighted changes in materials, capital and labour inputs. Changes are calculated at the firm level, but income shares refer to the industry average in order to minimise measurement errors. The capital stock is based on the perpetual inventory method and material inputs are also considered. Real values for output are calculated by applying 2-4 digit industry deflators.

Comparability issues

Two prominent aspects of the data have to be borne in mind while comparing firm-level data across countries:[1]

Unit of observation: The data used in this study refer to 'firms' rather than 'establishments'. More specifically, most of the data used conform to the following definition of a firm (Eurostat, 1995): "an organisational unit producing goods or services which benefits from a certain degree of autonomy in decision-making, especially for the allocation of its current resources". Nevertheless, business registers may define firms at different points in ownership structures; for example, some registers consider firms

Box 1 contd.

that are effectively controlled by a "parent" firm as separate units, whilst others record only the parent company.[2]

Size threshold: While some registers include even single-person businesses, others omit firms smaller than a certain size, usually in terms of the number of employees but sometimes in terms of other measures such as sales (as is the case in the data for France and Italy). Data used in this study exclude single-person businesses. However, because smaller firms tend to have more volatile firm dynamics, remaining differences in the threshold across different country datasets should be taken into account in making international comparisons.[3]

1. For more detail on the comparability of the firm-level data, see Bartelsman *et al.*, (2002).
2. In a sensitivity analysis , the decomposition of productivity growth has been repeated for the United States, on the basis of establishment data instead of firm data. The results are largely unchanged, at least with respect to the sign and broad magnitude of the different components.
3. However, a sensitivity analysis on Finnish data, where cut-off points were set at 5 and 20 employees, reveals broadly similar results for the productivity decomposition and aggregate entry and exit rates

1.2 What drives aggregate productivity growth? Reallocation of resources versus within-firm growth

12. In a given industry, productivity growth is the result of different combinations of: *i*) productivity growth of existing firms; *ii)* changes in market shares amongst them; and *iii)* the entry and exit of firms to the market. Depending on the measure of productivity (labour or multifactor), within-firm productivity growth depends on changes in efficiency and the intensity with which inputs are used in production. Shifts in market shares amongst incumbents reflect inter-firm resource reallocation, and affect aggregate productivity trends if, for example, highly productive firms gain market shares. The process of entry and exit of firms is another form of reallocation, which contributes to aggregate productivity growth to the extent that more productive new firms displace obsolete ones. The overall contribution of reallocation to productivity growth is generally viewed as reflecting a competitive process taking place in the market, although it may also reflect changes in demand conditions and, as argued above, may also be an aspect of technological progress.

13. There may be important interactions between these components of productivity growth. For example, the entry of highly productive firms in a given market may stimulate productivity-enhancing investment by incumbents trying to preserve their market shares. Moreover, firms experiencing higher than average productivity growth are likely to gain market shares if the productivity gain is associated with upsizing, while they will lose market shares if their improvement was driven by a process of restructuring associated with downsizing.

14. There are a number of ways in which aggregate productivity can be decomposed into these components. The decompositions reported below refer to labour and multifactor productivity on the basis of two approaches, based on Griliches and Regev (1995, GR henceforth) and Foster, Haltiwanger and Krizan (1998, FHK henceforth) (see Box 2 and Barnes *et al.*, 2002 for details). The analysis is based on 5-year rolling windows for all periods and industries for which data are available.

1.2.1 The decomposition of labour productivity: within-firm growth plays a dominant role

15. Figure 1 presents the decomposition of labour productivity growth in manufacturing sectors for two five-year intervals, 1987-92 and 1992-97. Both the GR, and especially the FHK decomposition

method, suggest that labour productivity growth within each firm accounted for the bulk of total growth (from 50 to 85 per cent of the total). The impact on productivity *via* the reallocation of output across existing enterprises (the "between" effect) varies widely across countries and time, but it is typically small, especially if one does not consider the "cross-effect" in the FHK decomposition. The latter is mostly negative, implying that firms experiencing an increase in productivity relative to the industry average were also losing employment shares, i.e. their productivity growth was associated with restructuring and downsizing rather than expansion. Under these circumstances, the overall contribution to GDP growth of these firms is lower than that for labour productivity and may even be negative. Finally, the net contribution to overall labour productivity growth of the entry and exit of firms (net entry) is positive in most countries (with the exception of western Germany over the 1990s), typically accounting for between 20 per cent and 40 per cent of total productivity growth.

Box 2. The decomposition of productivity growth

One approach used to decompose productivity growth is from Griliches and Regev (1995): in this decomposition, each term is weighted by the average (over the time interval considered) market shares as follows:

$$\Delta P_t = \sum_{Continuers} \overline{\theta_i} \Delta p_{it} + \sum_{Continuers} \Delta \theta_{it} (\overline{p_i} - \overline{P}) + \sum_{Entries} \theta_{it} (p_{it} - \overline{P}) - \sum_{Exits} \theta_{it-k} (p_{it-k} - \overline{P}) \qquad [1]$$

where *Δ* means changes over the k-years' interval between the first year (t – k) and the last year (t); θ_{it} is the share of firm *i* in the given industry at time *t* (it could be expressed in terms of output or employment); p_i is the productivity of firm *i* and *P* is the aggregate (*i.e.* weighted average) productivity level of the industry.[1] A *bar* over a variable indicates the averaging of the variable over the first year (t – k) and the last year (t). In equation [1], the first term is the within component; the second is the between component, while the third and fourth are the entry and exit component, respectively.

Another decomposition has been proposed by Foster, Haltiwanger and Krizan (1998). It uses base-year market shares as weights for each term of the decomposition, and includes an additional term (the so-called "covariance" or "cross" term) that combines changes in market shares and changes in productivity (it is positive if enterprises with growing productivity also experience an increase in market share) as follows:

$$\Delta P_t = \sum_{Continuers} \theta_{it-k} \Delta p_{it} + \sum_{Continuers} \Delta \theta_{it} (p_{it-k} - P_{t-k}) + \sum_{Continuers} \Delta \theta_{it} \Delta p_{it} + \sum_{Entries} \theta_{it} (p_{it} - P_{t-k}) - \sum_{Exits} \theta_{it-k} (p_{it-k} - P_{t-k}) \qquad [2]$$

One potential problem with this second 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 could be spurious, affecting the within- and between-firm effects. The averaging of market shares in the GR method reduces this error. However, the interpretation of the different terms of the decomposition is less clear-cut in the GR method. If market shares indeed change significantly over the five-year interval, the 'within' effect in fact also includes a reallocation effect.

1. The shares are based on employment in the decomposition of labour productivity and on output in the decomposition of total factor productivity.

[Figure 1. Decomposition of labour productivity growth in manufacturing]

16. Before proceeding in the review of the productivity decomposition it is worth recalling that while data for most countries are fairly comparable, those for France and Italy are somewhat problematic in the context of an international comparison: the large within-firm effect in France may well be due to a substantial over-representation of large firms, whilst the entry and exit results in Italy, albeit not inconsistent with those of the other countries, do not totally reflect the impact of "true" births and deaths of firms.[3] These caveats have to be borne in mind while reading the results for these two countries.

17. In countries where a sufficiently long time series is available, evidence suggests that year-to-year changes in the within-firm component are the main drivers of fluctuations in aggregate productivity growth over the business cycle; the *between* and *net entry* components show only modest fluctuations (see Figure A.1 in the Annex). Consequently, in years of expansion, within-firm growth makes a stronger contribution to overall productivity growth, whilst in slowdowns the contribution of between and net entry components increase in relative importance.[4]

18. There are significant differences in the contribution of entries to productivity growth. Leaving aside France and Italy, for the reasons indicated above, data for the other European countries show that new firms typically make a positive contribution to overall productivity growth (see Table 1), although the effect is generally of small magnitude. By contrast, entry in the United States for most industries makes a negative contribution to industry productivity growth.[5] This finding is consistent with further evidence provided below, pointing to a somewhat different nature of the entry process in the United States compared with most other countries. Less surprising, the exit contribution to productivity growth is typically positive across the data for all countries (Table 1), indicating that exiting firms usually have below-average levels of productivity.

[Table 1. Analysis of productivity components across industries of manufacturing and services]

19. It should be noted that the results of productivity decompositions are influenced by the length of the time interval over which growth is calculated. Firstly, by construction, the contribution of entering firms is greater the longer the time interval considered.[6] Second, if new entrants undergo a significant process of learning and selection, the time horizon is likely to affect the comparison between entering and

3 . The French data refer to firms with at least 20 employees or with a turnover greater than 0.58m euro. They are not likely to be representative of the total population. It is also likely that larger firms are over-sampled, lowering the net entry effect and raising the within effect. The Italian data refer to firms with a turnover of at least 5m euro. Sample size is maintained by deleting firms falling below the threshold and adding new firms in. Thus, the Italian data are likely to overstate true entry and exit rates. Furthermore, the sampling rules are likely to over-record exiting firms with falling productivity (see Barnes *et al*., 2002).

4. The results are also broadly consistent with findings in Baily *et al.* (1992) and Haltiwanger (1997) for the decomposition of MFP growth in the US manufacturing sector: during a period of robust productivity growth (1982-87), the within-firm contribution is large and positive, while in a low growth period (1977-82) the contribution is negative.

5 . Because the entry component involves using the difference between end-of-period productivity of entrants and *initial* (or period average) productivity, a positive entry component does not necessarily mean that entrants have relatively high productivity compared to their peers; it can simply reflect strong productivity growth among all firms over the period. Data for some countries allow this issue to be explored. Results indicate that a large number of the positive entry contributions (assessed across industries in manufacturing) at least partly reflect relatively high productivity levels of entrants. At the same time, however, it appears that the positive entry effects seen in the decomposition for manufacturing as a whole often reflects productivity growth rather than relatively high entry productivity.

6. The share of activity (the weighting factor in the decomposition, see Box 2) of entrants in the end year increases with the horizon over which the end year are measured (see Foster *et al.*, 1998).

other firms. Evidence for the United States suggests that these two factors significantly affect the decomposition of productivity growth: for example, over a ten-year horizon (instead of five as in the present study) entry generally makes a significantly stronger contribution to aggregate productivity growth (see Baily *et al.* 1996, 1997; and Haltiwanger, 1997).

20. Available data also permit the assessment of differences in industry behaviour within the manufacturing sector. The contribution made by entry and exit to productivity growth varies considerably across industries. Nevertheless, a few common patterns can be identified (see Table A.1 in the Annex). Notably, in high tech industries, including those more closely related to ICT, the entry component makes a stronger than average contribution to labour productivity growth.[7] This is particularly the case in the United States, where the contribution from entrants to total labour productivity is strongly positive, in contrast to the negative effect observed in most of the other manufacturing industries. This suggests an important role for new firms in an area characterised by a strong wave of technological change. The opposite seems to be the case in more mature industries, where a more significant contribution comes from either within-firm growth or the exit of presumably obsolete firms. However, there are instances where exiting firms have above-average productivity levels, which often relate to periods of downturn and restructuring in mature industries. For example, the data for the Netherlands show that exits made a negative contribution to manufacturing productivity growth in several years between the late 1980s and early 1990s, a result that is driven by sectors such as *wood products*, *paper and printing* and *chemicals*.

21. The decomposition of labour productivity growth in service sectors gives far more varied results than for manufacturing, no doubt because of the difficulties in measuring value added in this area of the economy.[8] But, in three broad sectors, *transport and storage*, *communication* and *trade*, the results are qualitatively in line with those for manufacturing (Figure 2). The within-firm component is generally larger than that related to net entry and reallocation across existing firms, although in *transport and storage* as well as in *communication*, entering firms seem to make a positive contribution to overall aggregate growth.

[Figure 2. Decomposition of labour productivity growth in selected service sectors]

1.2.2 The decomposition of multifactor productivity: a stronger effect from reallocation

22. The decomposition of multifactor productivity (MFP) growth in the manufacturing sector of six countries suggests a somewhat different picture from that shown with respect to labour productivity (Figure 3). Thus, the within-firm component is still the largest, but it offers a comparatively smaller contribution to overall MFP growth, while the reallocation of resources across incumbents (*i.e.* the between effect) is always positively signed, suggesting a shift of output shares away from the least efficient incumbents. A strong contribution to MFP growth generally comes from net entry in the early 1990s, and in particular by the entry of new high-productive firms. Combining the information on labour and multifactor productivity decompositions it could be tentatively hypothesised that, at least in the European countries for which data are available, incumbent firms have increased labour productivity mainly by substituting capital for labour (capital deepening) or by exiting the market altogether, although the most

7. The industry group is "*electrical and optical equipment*". In the United States, most 3-4 digit industries within this group had a positive contribution to productivity stemming from entry. In the other countries, there are cases where, within this group, the contribution from entry is very high, including the "*office, accounting and computing machinery*" industry in Finland, the United Kingdom and Portugal and "*precision instruments*" in France, Italy and the Netherlands.

8. See *e.g.* Scarpetta *et al.* (2000) for more details on measurement issues in service sectors.

efficient units (in terms of MFP) have gained market shares.[9] Moreover, many new firms may have entered the market with the "appropriate" combination of factor inputs, and new technologies, thus leading to higher levels of MFP but not necessarily higher levels of labour productivity.

[Figure 3. Decomposition of multifactor productivity growth in manufacturing]

1.2.3 Additional evidence from the productivity decomposition

23. The productivity decomposition discussed above is a simple accounting exercise that does not consider possible interactions between its different elements. Information on the variability of labour productivity within each of these elements offer some interesting elements, in particular:

- There is a positive correlation between the entry rate in a given industry and the average labour productivity levels, that is to say, high productivity industries are associated with relatively high entry rates. This may reflect both the effect that new firms put competitive pressure on incumbents, leading to more exits but also increased productivity amongst those that remain, and that high productive industries attract more entrants.

- Within each country, high productivity industries tend to have a wider dispersion of productivity levels. Specifically, most industries, regardless of their aggregate level of productivity, have a number of relatively low productive firms. High aggregate productivity in some industries is partially accounted for by the presence of "exceptional" performers that lengthen the right-hand tail of the distribution of industry productivity.

- The variability of productivity levels amongst entering (and exiting) firms is higher in the United States than in the other countries for which data are available. This is consistent with a greater heterogeneity of entering firms in the United States, compared with the other countries, an issue that is discussed further below.

1.3 Firm dynamics and survival

1.3.1 The significant firm turnover largely reflects "churning" amongst small enterprises

24. Since the entry and exit of firms makes a significant (albeit not the most important) contribution to aggregate productivity growth, it is of interest to see how frequently new firms are created and how often existing units close down, across countries and sectors. In fact, the number of entering and exiting firms accounts for a sizeable proportion of the total number of firms in most markets. Data covering the first part of the 1990s show firm turnover rates (entry plus exit rates) to range from 15 to more than 20 per cent in the business sector: *i.e.* a fifth of firms are either recent entrants, or will close down within the year (Figure 4). Turnover rates vary significantly across detailed industries in each OECD country and, therefore, differences in the industry composition influence the international comparison of average turnover. Controlling for the sectoral composition suggests that Germany (western) and Italy have

9. This finding is consistent with aggregate data for a number of European countries (see Scarpetta *et al.*, 2000). In particular, in many continental European countries high labour productivity growth in the 1990s was accompanied by significant falls in employment, especially in manufacturing, leading to low (compared to the 1980s) GDP *per capita* growth rates. Moreover, the relatively high labour productivity growth was accompanied by significant falls in MFP growth with respect to the previous decade.

somewhat smaller turnover rates than the United States, while turnover is consistently higher in the United Kingdom (manufacturing sector) and especially in Finland.

[Figure 4. Turnover rates in OECD countries, 1989-94]

25. The industry dimension also makes it possible to compare entry and exit rates and characterise turnover. If entries were driven by relatively high profits in a given industry and exits occurred primarily in sectors with relatively low profits, there would be a negative cross-sectoral correlation between entry and exit rates. However, confirming previous evidence,[10] entry and exit rates are generally highly correlated across industries in OECD countries (this is particularly so when the rates are weighted by employment). This suggests that in every period, a large number of new firms displace a large number of obsolete firms, without affecting significantly the total number of firms or employment in the market at each point in time.

26. The high correlation between entry and exit across industries may be the result of new firms displacing old obsolete units, as well as high failure rates amongst newcomers in the first years of their life. This can be assessed by looking at survival rates, *i.e.* the probability that new firms will live beyond a given age (Figure 5). The survival probability for cohorts of firms that entered their respective market in the late 1980s declines steeply in the initial phases of their life: only about 60-70 per cent of entering firms survive the first two years. Having overcome the initial years, the prospects of firms improve further: those that remain in business after the first two years have a 50 to 80 per cent chance of surviving for five more years. Nevertheless, in the countries considered, only about 40 to 50 per cent of firms entering in a given year survive on average beyond the seventh year.

[Figure 5. Firm survivor rates at different lifetime, 1990s]

27. As in the case of firm turnover, differences in the industry mix across countries could partly cloud the international comparison of survivor rates. Table 2 presents the differences (in percentage points) in the hazard rates after 2 and 4 years of life with respect to the United States, after controlling for sectoral composition. Finland and the United Kingdom stand with markedly higher infant mortality rates than the United States, while for the other countries they are broadly similar. However, hazard rates decline more steeply in most countries compared with the United States, the sole exception being the United Kingdom (manufacturing). The results for Finland are consistent with the arguments discussed above of a major restructuring taking place in the early 1990s, while those for the United Kingdom are consistent with a view of significant turnover.

[Table 2. Cross-country differences in hazard rates relative to the United States]

28. There is substantial variation in survival rates at different life spans across manufacturing industries and the entire business sector. In particular, the variance of "infant mortality" (i.e. failure within the first few years) across industries is of the same order of magnitude than the variance of entry rates across industries (Table 3).[11] These industry differences in failure rates are also reflected in the cross-industry variability of long-term survival rates (*i.e.* 5 to 7 years of age) which remains substantial. If the cross-industry variability is taken as an indicator of the different market barriers that affect young

10. See, amongst others Geroski (1991) and Baldwin and Gorecki (1991).

11. Table 3 presents the standard deviations of cross-industry entry and hazard rates. These two sets of standard deviations are comparable given that entry and hazard rates are of the same order of magnitude (i.e. they typically range between 5 and 20 per cent). The table shows that the cross-industry variability of entry rates is similar to that of hazard rates, especially if the latter are taken in the first years of a firm's life and amongst firms reaching the sixth or seventh year of life.

firms, the evidence reported in Table 3 may indicate a degree of commonality between industry characteristics that affect barriers to entry and those that condition firm survival (see also Geroski, 1995).

[Table 3. Variability of entry rates and hazard rates, 1989-94]

29. The process of entry and exit of firms involves a proportionally low number of workers: only about 10 per cent of employment is involved in firm turnover, and in Germany and Canada, employment-based turnover rates are around 5 per cent (Panel B in Figure 4). The difference between firm turnover rates and employment-based turnover rates arises from the fact that entrants (and exiting firms) are generally smaller than incumbents (Figure 6). For most countries, new firms are only 40 to 60 per cent the average size of incumbents, and in the United States, Germany and Canada their average size is less than 30 per cent of that of incumbents (Figure 6).[12] The relatively small size of entrants in these countries reflects either the large size of incumbents (e.g. the United States, see Bartelsman *et al.*, 2002) or the small average size of entrants compared with that in most other countries (Germany and Canada, see Figure 6). This would suggest that, in the United States, Canada and Germany, entrant firms are further away from the average size in a given industry (what could be interpreted as the minimum efficient size).

[Figure 6. Average firm size of entering and exiting firms, 1989-94]

30. The likelihood of failure in the early years of activity is highly skewed towards small units, while surviving firms are not only larger but also tend to grow rapidly. Thus, in most countries the size of exiting firms is broadly similar to that of entering firms (see Figure 6 above). Moreover, the average size of surviving firms increases rapidly to approach that of incumbents in the market in which they operate. On this latter point, there are significant differences across countries (Figure 7): in the United States, surviving firms on average double their employment in the first two years, while employment gains amongst surviving firms in Europe are in the order of 10 to 20 per cent.[13]

[Figure 7. Employment gains among surviving firms at different lifetimes]

31. The marked difference in post-entry behaviour of firms in the United States compared with the European countries is partially due to the larger gap between the size at entry and the average firm size of incumbents, i.e. there is a greater scope for expansion amongst young ventures in the US markets than in Europe. In turn, the smaller relative size of entrants, can be taken to indicate a greater degree of experimentation, with firms starting small and, if successful, expanding rapidly to approach the minimum efficient scale.[14]

1.4 Summing up the evidence on firm-level productivity decomposition and firm dynamics

32. The evidence presented in this Section underlines the existence of a significant firm dynamism in most industries and countries. Aggregate productivity patterns over the medium-term horizon are dominated by within-firm behaviour, but nevertheless resource reallocation often plays an important role. In particular, a marked role is played by a process of “creative destruction”, whereby many (predominantly

12. A similar picture emerges from the decomposition of entry by size: entry rates amongst firms with more than 20 employees are half to a third of the overall entry rate.

13. The results for the United States are consistent with the evidence in Audretsch (1995). He found that the four-year employment growth rate amongst surviving firms was about 90 per cent.

14. However, there are other additional factors which could contribute to explain the observed differences in post-entry behaviour, including the larger size of the US market compared to that of EU countries. See Bartelsman et al., 2002 for details on these factors.

small) firms enter and exit each market every year. While the exit of obsolete firms from the market often contributes to speed up industry productivity, new entrants do not always have higher productivity levels than incumbents. However, consistent with vintage models of technological changes, in high-tech industries, where new firms are more likely to adopt state-of-the-art technologies, the entry of firms significantly boosts the industry's overall productivity.

33. The analysis also finds that there is a similar degree of *firm churning* in Europe and the United States. In fact, controlling for industry and time effects, firm turnover rates in the United States are somewhat smaller than the majority of European countries examined, with the exception of Italy and Germany. Similarly, failure amongst young firms in the United States is generally close to, or even lower than, that of other countries. The distinguishing features of firms' behaviour in the US market compared with the EU counterpart are: *i*) the smaller (relative to industry average) size of entering firms; *ii*) the lower labour productivity level of entrants relative to the average incumbent; and *iii*) the much stronger (employment) expansion of successful entrants in the initial years which enable them to reach a higher average size. These differences in firms' performance can only partly be explained by statistical technicalities or business cycle conditions (see Bartelsman et al, 2002 for more details), and seem to indicate a greater degree of *experimentation* amongst entering firms in the United States. Firm characteristics at entry are influenced by market conditions (concentration, product diversification, advertising costs etc.) but may also depend on regulations and institutions affecting start-up costs and efficiency-enhancing decisions by existing firms. Section 2 further discusses these issues.

2. THE DRIVING FORCES OF PRODUCTIVITY GROWTH AND FIRM DYNAMICS

34. This Section explores possible influences of policy and institutional settings on the observed patterns of productivity and firm dynamics. The choice of the appropriate level of disaggregation, always an issue in this kind of analysis, was determined by these aims. Firm-level data do not generally permit assessment of whether, and how, policy and institutional settings contribute to shape individual firm performance. By their very nature, most indicators of policy and institutional settings have only a country and, possibly, a time dimension, although they may affect industries differently, depending on (exogenous) industry-specific factors (see below). Moreover, a firm's performance depends on a complex set of idiosyncratic factors that can only partly be controlled for in the empirical analysis. These factors markedly widen the stochastic variation in the performance variable under examination (e.g. productivity growth or entry rate), making it difficult to draw country-wide or industry-wide policy conclusions from a firm-level analysis.[15] Thus, while exploiting the firm-level information, the empirical analysis of the policy and institutions driving productivity and firm dynamics is conducted at the industry level by means of panel data.

2.1 Regulations, institutions and firm entry

35. The first objective of the empirical analysis is to assess whether policy and institutional factors help to explain the observed differences in entry rates across countries and industries, as documented in the previous section. This analysis extends previous studies by linking together the OECD firm-level dataset with the OECD indicators of regulations and institutional settings for manufacturing and service sector industries for 9 countries over a period from the mid-1980s to mid-1990s.[16]

36. The entry equation is based on a theoretical model in which entry depends on the expected (post-entry) profits, defined net of the costs of entry (see Geroski, 1995 and Siegfried and Evans, 1994, for a survey). Market profitability is proxied by a (smoothed) growth rate of industry value added.[17] Proxies for potential entry costs include a measure of the industry capital intensity -- i.e. high capital intensity is

15. In particular, even when the most comprehensive micro dataset is available, certain unmeasured factors (*e.g.* entrepreneurial ability, work organisation, formal/informal links with other firms, etc.) are likely to affect the way in which any given (national, sectoral) policy affects firms' behaviour, possibly leading to biased estimates due to an omitted variable(s) problem.

16. Canada had to be excluded because of the lack of details on entry rates by size of firms.

17 . The growth rate of industry value added is smoothed using a Hodrick-Prescott filter to limit the influence of short-run business cycle fluctuations. The same approach has been used for the indicator of capital intensity (see below).

expected to raise entry costs because it implies, *ceteris paribus,* a larger share of fixed costs[18] -- and indicators of the stringency of regulations that could influence entrepreneurship (see Box 3).[19] Available data also allow control for the size distribution of firms (using five size classes, from *fewer than 20* employees to *more than 500* employees). This is of importance, given the strong size effect on firm dynamics and also because it permits testing of whether incentives and disincentives to entry differ by size.[20]

37. Table 4 presents the baseline entry equation that only controls for country, industry, size and time effects. The results of this equation shed some light on possible country-specific effects on entry rates once control for differences in size and sector composition are taken into account. The omitted sector is "*textile, footwear and leather",* the omitted size class is 20-49 and the omitted country is the United States. Equation A includes year dummies to control for specific time effects, while the second uses a country-specific measure of the business cycle. Equation C includes both, in order to test for common and country-specific time patterns of entry. Since the inclusion of the business cycle variable in a specification with time dummies does not significantly affect the results, this variable is not included in the other specifications. Finally, equation (D) controls for the presence of outliers in the data and equation (E) replicates it without size dummies to identify the overall country-specific effects, including those related to differences in the size structure of firms.[21]

[Table 4. Entry rate regressions: baseline specification]

38. As noted in Section 1, the estimated country differences in entry rates are generally statistically significant but not very large once control is made for differences in the industry composition across countries. In addition, there is clear evidence of a non-linear relationship between the entry rates and size: small firms (with fewer than 20 employees) have significantly higher entry rates than the reference group (20-49 employees), *ceteris paribus*, while larger firms (50 and more employees) have only marginally lower entry rates with respect to the reference group.

39. Table 5 moves one step further in the analysis to include proxies for profitability and entry barriers that could partially account for the country and industry fixed effects. The analysis starts with the most parsimonious specification and then adds other explanatory variables. This allows to check the robustness of results and possible interactions between explanatory variables. The equation to the far right of the table offers the best specification of the entry equation in terms of comprehensiveness and statistical fit. It should be stressed that these empirical results are somewhat tentative: the country coverage is

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18 . The use of the capital intensity measure (capital stock divided by value added) at the industry level somewhat reduces the sample size. A sensitivity analysis, in which this variable is replaced by a more widely available measure of labour intensity (employment divided by value added), yields broadly similar results (with the opposite sign).

19 . In previous studies, expected post-entry profits are proxied by lagged profitability or, more often, by current and lagged growth rates of output or value added, as in the present analysis. Entry costs are proxied by indicators of capital and advertising intensity, minimum efficient scale (median plant size of the industry) and sunk costs. Most of the existing studies, however, use cross-sectional data for a given country and do not consider direct policy and institutional influences on entry costs.

20 . The panel is unbalanced across the different dimensions (especially along the time and sectoral dimensions) but, as suggested by Baltagi and Chang (1994), reducing the sample set to make it balanced can severely hamper the quality of empirical results.

21 . All equations exclude a number of outlier observations identified on the basis of the DFIT and COVRATIO statistical tests. These observations significantly increase the standard error of the regression, or affect the estimated coefficients. The same observations have been excluded in all entry equations to ease comparisons of results across the different specifications.

relatively narrow and not many potentially important covariates can be considered. Bearing this in mind, the results in the different specifications suggest that the growth rate of industry value added enters with the expected sign (positive), but there is evidence of a differentiated impact of industry growth on the entry of small firms (fewer than 20 employees) with respect to the others and this distinction is considered from equation B onwards.[22] Capital intensity has the expected negative sign though at somewhat variable levels of significance. The different indicators of the stringency of product market regulations are always negatively signed and, in most cases, statistically significant.[23] In particular, administrative regulations on entrepreneurial activities seem to have a strong negative effect on entry rates, *ceteris paribus* (column D). This effect is mainly felt by small and medium-sized firms (up to 49 employees) while an opposite effect is seen for larger firms (column F).

[Table 5. Entry rate regressions: the role of regulations and institutions]

40. The lack of sectoral or time dimensions in the indicators of product market regulation used in equations C, D and F of Table 5 means that no additional control for country fixed effects can be included in the entry equations. This may lead to assigning an explanatory power to these regulatory indicators, which is, in fact, due to other omitted country-specific influences. However, an assessment of the robustness of results can be obtained by using the available *sector-specific* indicator of the stringency of product market regulations (equations E and G, see Box 3 for details on these indicators). Reassuringly, the results seem to be robust to control for other unmeasured country influences, and largely replicate the results of equations D and F.

Box 3. Indicators of the stringency of product market regulations and employment protection legislation

In the empirical analysis, three types of indicators of product market regulations are considered (see Scarpetta and Tressel, 2002 for more details).

The overall index of the stringency of product market regulation (PMR) is a static indicator (referring to conditions in 1998), composed of three elements: i) direct state control of economic activities, through state shareholdings or other types of intervention in the decisions of business sector enterprises and the use of command and control regulations; ii) barriers to private entrepreneurial activity, through legal limitations on access to markets, or administrative burdens and opacities hampering the creation of businesses; and iii) regulatory barriers to international trade and investment, through explicit legal and tariff provisions or regulatory and administrative obstacles (see Nicoletti, Scarpetta and Boylaud, 1999 for more details). The indicator has a wide coverage of regulatory aspects, but no industry or time dimension. In order to further characterise the regulatory settings, this indicator is further split into two components: economic regulations (state control, legal barriers to entry etc.) and administrative regulations (administrative burdens on start-ups, features of the licensing and permit system etc.).

22. The sensitivity analysis tested whether the coefficient on trended value added growth differ significantly across size classes. The results suggest that incentives to enter a market as proxied by value added growth are particularly strong for small firms. The differentiation of these coefficients by size classes also allows to tackle the potential downward bias in the standard errors of their coefficients in the non-differentiated specification, *i.e.* observations for these two variables are repeated across the different size classes.

23. The specifications that use country-wide indicators of product market regulations cannot also include country specific effects. However, standard errors and variance-covariance matrix of the estimators are adjusted for cluster level effects on country-industry using the procedure suggested by Moulton (1986).

Box 3 contd.

The industry-specific indicator of product regulation (PMR sectoral) is also a static indicator (referring to 1998), but it varies across service-sector industries (retail and wholesale trade; transport and communication; financial intermediation and business services). The indicator always includes barriers to entrepreneurial activity and public ownership, while for certain industries it also considers other aspects of regulation. For the manufacturing industries, for which no specific information on regulations is available, the economy-wide indicator of administrative regulations is used as a proxy in the construction of this sector-specific indicator.[1]

The aggregate time-varying indicator of the stance of regulation (PMR time-varying) is a simple average of time-varying indicators of the stringency of regulations in electricity, gas and transport and communication. This average is used to proxy the overall stance of regulatory reform in each OECD country. Its clear advantage in the empirical analysis is the time dimension but, given that it only covers certain (albeit key) service industries, it can be considered should be considered as a first approximation of the economy-wide regulatory reform stance of OECD countries (see Nicoletti et al., 2001 for more details).

The indicators of employment protection legislation are available for two periods (late 1980s and 1998) and focus on both regular and temporary contracts (see Nicoletti et al. 1999). Regulations for regular contracts include: i) procedural inconveniences that employers face when trying to dismiss a worker; ii) advance notice of the dismissal and severance payments; and iii) prevailing standards of, and penalties for, "unfair" dismissals. Indicators of the stringency of EPL for temporary contracts include: i) the "objective" reasons under which they can be offered; ii) the maximum number of successive renewals; iii) and the maximum cumulated duration of the contract. The EPL indicator used in the econometric analysis is time-varying, with the shift in regime from the late 1980s stance to that of 1990s being defined on the basis of information about the timing of major EPL reforms (concerning both temporary and regular workers) in OECD countries.

It should be stressed that all indicators (both PMRs and EPL) are constructed on the basis of differences in regulatory settings across OECD countries. The focus is on excessive regulation that could unnecessarily restrict market mechanisms, either because it thwarts competition where competition could be viable, or because it makes reallocation of resources difficult, hindering the response of the economy to structural changes.

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1. The indicator of administrative regulations is used as a proxy instead of the overall indicator of product market regulations because it refers to norms and regulations that are applied to all industries, while the overall indicator also includes economic regulations, some of which are more sector specific and do not apply to manufacturing industries.

41. One potential influence captured by the country-specific effects is related to labour adjustment costs, proxied by the indicator of the strictness of employment protection legislation (see Box 3). From an empirical point of view, the inclusion of EPL in the regression is problematic, given the high correlation with the overall indicator of product market regulation. In order to identify the two effects, equation H uses again the *sector-specific* indicator of product market regulation, together with a *nation-wide* -- but time-varying -- indicator of EPL. In other words, the time dimension allows identification of the EPL coefficient, the sectoral dimension identifies the product market indicator, and the inclusion of country dummies minimise the risk of an omitted variable problem. The negative impact of strict product market regulation on the entry of small firms is confirmed, but there is clear evidence of an additional negative effect from tight regulations on hiring and firing. Notably the estimated effect is of opposite sign for micro (fewer than 20 employees) and for small-medium sized firms (20-49 employees): positive (albeit

significant only at 10 per cent level) in the first and negative in the second.[24] This is consistent with the fact that in a number of countries with relatively tight EPL (e.g. Germany, Italy, Portugal), firms below a given size threshold (ranging from 5 to 25 employees) are exempted from certain aspects of the employment protection legislation.[25] Under these circumstances, firm entry seems to shift towards either smaller units -- partially exempted from EPL -- or to significantly larger ones, for which hiring and firing costs play a smaller role in total expected entry costs as well as in the subsequent costs of adjusting the workforce.[26]

42. In summary, taken at face value these results suggest a statistically significant (albeit not large) direct effect of regulation on entry rates. In particular, a reduction in the administrative barriers to entrepreneurial activity equal to two standard deviations (calculated on the basis of the cross-country distribution) could lead to an increase in entry rates amongst small firms by about 1.3 percentage points, with an additional increase in entry rates amongst small- and medium-sized firms of about 0.7 percentage points, with a similar easing of employment protection legislation. These are direct effects to which one can add the possible indirect effects stemming from the impact of these regulatory reforms on productivity (see below) and, possibly, even on the size distribution of firms (see Nicoletti *et al.*, 2001).

2.2 Regulations, institutions and productivity

43. The second empirical issue addressed in this Section is the possible influence of policy and institutions on the observed differences in productivity levels across countries and industries. In particular, two elements are considered: *i*) the degree of competition in the product market, and policy that could affect it; and *ii*) institutional settings in the labour market. The multifactor productivity equation is derived from a production function in which technological progress is a function of country/industry specific factors, as well as a catch-up term that measures the distance from the technological frontier in each industry (see Box 4).[27] This framework allows to test for the direct effect of institutions and regulations on estimated productivity,[28] as well as for the indirect influences of these factors *via* the process of technology transfer.[29]

24 . The positive coefficient of EPL for very large firms (500 employees and more) is puzzling, but should perhaps not be overemphasised, insofar as there are a relatively small number of observations for this size class across industries and countries.

25 . These findings seem also consistent with those presented in Nicoletti *et al.* (2001) pointing to a negative effect of EPL on the average size of firms.

26 . Indeed, the incidence of strict EPL on total labour adjustment costs may decline with the size of the firm, as larger ones may more easily reallocate labour within them and spread these costs over a larger capital stock.

27. Griffith *et al.* (2000) have, amongst others, used a similar approach. However, their study does not include regulatory variables, nor does it consider industry differences in a number of important covariates (*e.g.* hours worked, human capital). A number of other studies have looked at productivity convergence using industry/country data. Amongst them, see Dollar and Wolff (1988, 1994); Bernard and Jones (1996*a*,*b*) and Harrigan (1997 a,*b*).

28 . As shown in Box 8, product market regulations are assumed to affect the level of efficiency as proxied by MFP.

29 . For example, if the adoption of new technologies relies partly on new firms, high entry barriers may reduce the pace of adoption (see *e.g.* Boone, 2000).

44. The empirical analysis covers 23 two-digit industries in manufacturing and business services in 19 OECD countries over the period 1984-1998.[30] The main data source is the 2001 OECD STAN database, which provides information on value added, capital stock, employment and labour compensation. In addition, data on sectoral occupational skills and hours worked have been assembled from various sources. (see Scarpetta and Tressel, 2002). Finally, indicators of product and labour market regulations are from Nicoletti *et al*., (1999) and those on labour market institutions are from Elmeskov *et al.* (1998).

45. The catch-up term, representing the distance from the technological frontier, is proxied by the difference between the MFP level in a particular industry and the highest level amongst countries for that industry. Although crude, this measure broadly confirms expectations about which countries and regions tend to be at the forefront of technology in certain fields. For example, the estimated levels of MFP (see Scarpetta and Tressel, 2002) reveals that the United States and Japan were often at the frontier (or close to it) in most industries considered in the 1980s and 1990s. However, especially if the lower levels of hours worked are taken into account, a number of European countries were also relatively close to the frontier, both in manufacturing and some service sectors. The comparison of MFP levels also suggests that in only a few cases does the identity of the frontier remain constant; i.e. in most industries, some countries leapfrogged others in terms of technology leadership. As shown below, however, what matters for productivity growth is the distance from the technological frontier -- which captures the potential for technology transfer -- rather than the identity of the frontier itself.

Box 4. The derivation of the multifactor productivity equation

Scarpetta and Tressel (2002) provide a full derivation of the productivity model underlying the empirical analysis presented in this section. The basic features of the model are summarised below.

The cross-country, cross-industry analysis of productivity is centred around a catch-up specification of productivity, whereby, within each industry, the production possibility set is influenced by technological and organisational transfer from the technology-frontier country to other countries. In this context, multi-factor productivity (MFP) for a given industry *j* of country *i* (MFP_{ijt}) can be modelled as an autoregressive distributed lag ADL(1,1) process in which the level of MFP is co-integrated with the level of MFP of the technological frontier country *F*: Formally,

$$\ln MFP_{ijt} = \beta_1 \ln MFP_{ijt-1} + \beta_2 \ln MFP_{Fjt} + \beta_3 \ln MFP_{Fjt-1} + \omega_{ijt} \quad [1]$$

where ω stand for all observable and non-observable factors influencing the level of MFP. Under the assumption of long-run homogeneity ($1-\beta_1=\beta_2+\beta_3$) and rearranging equation [1] yields the convergence equation:

$$\Delta \ln MFP_{ijt} = \beta_2 \Delta \ln MFP_{Fjt} - (1-\beta_1) RMFP_{ijt-1} + \omega_{ijt} \quad [2]$$

where $RMFP_{ijt}=ln(MFP_{ijt})-ln(MFP_{Fjt})$ is the technological gap between country *i* and the leading country *F*. Multi-factor productivity, MFP_{ijt}, is measured as the Hicks neutral productivity parameter, according to a standard neo-classical production technology under constant returns to scale. The rate of change of MFP can be expressed as follows:

$$\Delta MFP_{ijt} = \Delta y_{ijt} - \alpha_{ijt} \cdot \Delta l_{ijt} - (1-\alpha_{ijt}) \cdot \Delta k_{ijt} \quad [3]$$

where *i* denotes countries, *j* denotes industries and *t* time; *y*, *l* and *k* are respectively the logarithms of real value-added, total employment (or hours worked) and real capital stock. α is a smoothed estimate of the share of labour compensation in value-added. The following (multifactor productivity) index is used as a measure of the MFP level:

30. The countries are: Australia, Austria, Belgium, Canada, Denmark, Spain, Finland, France, (western) Germany, Greece, Italy, Japan, Netherlands, Norway, Portugal, Sweden, United Kingdom and United States. The industry breakdown is as follows: 17 manufacturing industries and 6 business services industries. Agriculture, mining and quarrying, construction, electricity gas and water as well as community and personal services have been excluded from the analysis either because of poor quality of the data or because of the dominance of public-owned firms, whose performances are likely to depend on a different set of factors.

Box 4 contd.

$$MFP_{ijt} = \frac{Y_{ijt}}{\overline{Y}_{jt}} \cdot \left(\frac{\overline{L}_{jt}}{L_{ijt}}\right)^{\alpha_{ijt}} \cdot \left(\frac{\overline{K}_{jt}}{K_{ijt}}\right)^{1-\alpha_{ijt}} \quad [4]$$

where a *bar* denotes a geometric average over all the countries for a given industry *j* and year *t*. The index has the desirable properties of superlativeness and transitiveness which makes it possible to compare national productivity levels (see Caves, Christensen and Diewert, 1982). However, the comparison of productivity levels also requires the conversion of underlying data into a common currency, while also taking into account differences in purchasing powers across countries.[1]

The catch-up variable relates to the aggregate convergence literature. Specifically, it allows tests of whether convergence -- generally found in macro analyses -- is driven by specialisation between industries and/or convergence within industries (see Dollar & Wolff, 1988, 1993). The residual in equation [2] is modelled as follows:

$$\omega_{ijt} = \sum_k \gamma_k V_{kijt-1} + f_i + g_j + d_t + \varepsilon_{ijt} \quad [5]$$

where (V_{ijt}) is a vector of covariates (*e.g.* product and market labour regulations) affecting the level of MFP; f_i , g_j, and d_t are respectively country, industry and year fixed effects. ε is an *iid* shock. Moreover, equation 2 can be solved for steady-state MFP in country *i* relative to the frontier in industry *j* which gives insights on the effects of these country and/or country-industry-specific factors on the steady-state level of MFP.

1. The analysis in this paper uses PPPs for total GDP (as in Dollar and Wolff, 1993; and Bernard and Jones, 1996*a*), but the sensitivity analysis also tests the robustness of results by using estimates of industry-specific expenditure PPPs (as in Griffith *et al.*, 2000).

46. Table 6 presents the main results of the MFP regressions. The technology-gap term (*RTFP*) enters negatively and is significant at conventional levels in all specifications, suggesting that, within each industry, countries that are further behind the frontier experience higher rates of productivity growth. However, consistently with some previous results (*e.g.* Bernard and Jones, 1996*a,b*), there is evidence of a more rapid technological catch-up in service industries as compared with manufacturing and, therefore, the reported specifications allow these coefficients to vary between these two broad sectors. This is even more important for the short-term MFP coefficient (i.e. that of MFP growth in the frontier country, ΔTFP_{leader}) that is not statistically significant for manufacturing industries. This is consistent with the view that convergence is relatively easier when technology is more standardised, as in many service sectors, than in cases where it is more diversified, as many manufacturing industries.

47. Moving to the policy and institutional variables, the results indicate a negative direct effect of product market regulations (see Box 3 above) on productivity, whatever indicator is considered.[31] However, if the interaction of regulation with the technology gap is also considered (equations E to H), the results point to a strong indirect effect and a less significant direct effect: i.e. strict regulations seem to have a particular detrimental effect on productivity the further the country is from the technology frontier, possibly because they reduce the scope for knowledge spillovers.[32]

[Table 6. Productivity regressions: the role of regulations and institutions]

31 . These results are broadly consistent with those of Blundell *et al*. (1995, 1999) and Nickell (1996) and Cheung and Garcia Pascual (2001), although these papers use direct proxies for the degree of product market competition which are subject to an endogeneity problem.

32 . It should be stressed, however, that the indirect effect of product market regulation on productivity may also reflect reverse causality: if strict regulations hinder technological improvements in a given industry, they may also result in a wider technology gap with the country leader.

48. The analysis is also extended to consider the industrial relations regimes[33] and summary indicators of employment protection legislation that proxy the cost of labour adjustment. The results do not lend support to the idea that different industrial relations regimes *per se* have a significant impact on productivity (equation K). However, differences in these regimes seems to affect significantly the estimated impact of EPL on multifactor productivity. In equation K, the EPL coefficient is negatively signed and statistically significant. However, if allowed to vary across the different industrial relations regimes (from equation L onwards), the negative impact of strict EPL on productivity is stronger and statistically significant only in countries with an intermediate degree of centralisation/co-ordination -- *i.e.* where sectoral wage bargaining is predominant without co-ordination -- while it is not statistically significant in either highly centralised/co-ordinated or decentralised countries. One potential explanation is that dynamic efficiency requires a continuous process of technological change, and the latter is often associated with skill upgrading of the workforce. The required adjustment of the workforce can be achieved either by relying on the internal labour market *via* firm-sponsored training, if EPL is strict, or by acquiring the necessary skills on the external labour market. In this context, strict EPL raises the costs of adjusting the workforce, and this may have a particularly detrimental effect on technology adoption if, in addition, the lack of co-ordination does not offer a firm the required institutional device to guarantee a high return on internal training, because other firms can poach on its skilled workforce by offering higher wages.[34]

49. As an illustration, the estimated coefficients on product market regulations and EPL can be used to assess the potential effects of policy reforms to the long-run level of multifactor productivity. In particular, a reduction in the stringency of product market regulations by two standard deviations may reduce the productivity gap by as much as 6 to 7 per cent in countries such as Greece, Portugal and Spain over the longer run.[35] In addition, an easing of employment protection legislation may also boost productivity directly, at least in countries where the adjustments costs associated to EPL are not offset by the possibility of adjusting wages or recurring to internal training: e.g. a reduction of two standard deviations in the stringency of EPL may help to reduce the MFP gap by about 20 per cent over the long run in countries such as Belgium, France and Portugal.

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33 . The summary indicator of the *bargaining system* (*corporatism*) combines two variables: *i*) the level of bargaining: centralised, intermediate (at sector or regional), or decentralised (firm level); and *ii*) the degree of co-ordination amongst, on the one hand, employers' associations and, on the other, trade unions. This combined variable allows consideration of cases where co-operation between employers and unions in an industry bargaining setting (*e.g.*, Germany and Austria and, more recently, Italy, Ireland, the Netherlands with the income policy agreements) may be an alternative, or functionally equivalent, to centralised systems, thereby mimicking their outcomes. In the table, the two variables referring to corporatism indicate the effects of intermediate or high/low centralisation/co-ordination with respect to that of an intermediate system. The distribution of countries according to the different aspects of collective bargaining and changes over time is presented in Elmeskov, Martin and Scarpetta (1998).

34 . In highly corporatist or intermediate regimes, wages tend to be compressed over the skill structure. In such circumstances, an individual firm may be able to reap high returns by investing in internal training because wages will not fully adjust to the higher productivity of trained workers, provided that other firms do not poach on its pool of skilled workforce. A centralised and/or co-ordinated bargaining system offers an institutional device that discourages poaching: *i*) contracts tend to cover a large fraction of employers and workers in most industries with limited room for differences in wage offers across industries, which, in turn, reduces incentives for highly skilled workers to change job (Teulings and Hartog, 1998; Acemoglu and Pischke, 1999a); ii) in such a regime, poaching may be considered as unfair behaviour (Blinder and Krueger, 1996; Casper *et al.*,1999); and finally iii) the cost of training is often shared among employers when business associations have a prominent role (Soskice, 1997, Casper *et al.*, 1999).

35 . These are the long-run effects of changes in regulations on the level of MFP of each country. See Scarpetta and Tressel (2002) for more details.

2.3 Summing up of results from entry and productivity regressions

50. The econometric analysis presented in this Section offers a number of results that may have implications for policy. Most prominently, there is evidence that stringent regulatory settings in the product market have a negative bearing on productivity and (although the results are more tentative) on market access by new firms. In addition, strict employment protection legislation, by reducing employment turnover, may in a number of circumstances lead to lower productivity performance and discourage the entry of firms.

51. However, it also appears that the impact on performance of regulations and institutions depends on certain market and technology conditions, as well as on specific firm characteristics. In particular, the burden of strict product market regulations on productivity seems to be greater the further a given country/industry is from the technology frontier. That is, strict regulation hinders the adoption of existing technologies, possibly because it reduces competitive pressures or technology spillovers, and restricts the entry of new high-tech firms. In addition, as concluded elsewhere (Bassanini and Ernst, 2002), strict product market regulations also have a negative impact on the process of innovation itself.

52. The link between EPL and productivity is also complex. There is evidence to suggest that high hiring and firing costs weaken productivity performance, especially when wages and/or internal training do not offset these higher costs, thereby inducing sub-optimal adjustments of the workforce to technology changes and less incentive to innovate. It is also likely that decisions to innovate and adopt new technologies depend on the joint configuration of: *i*) product market regulations that influence competition amongst incumbents and the entry of new firms; and *ii*) labour market arrangements affecting the extent to which firms use either the external or internal labour market to adapt the production process to evolving technologies.

53. The empirical analysis on entry also shows that product market regulations and EPL mainly affect market access of small, medium-sized firms. This offers a possible interpretation to the finding in the Section 1, i.e. the smaller relative size of entering firms and more rapid expansion of successful units in the United States, compared with European countries, may indeed reflect the relatively easier product market regulations (especially the administrative burden on entrepreneurship) and lower costs of adjusting the workforce to changes in demand conditions.

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Table 1. **Analysis of productivity components across industries of manufacturing and services**

Panel A. **Proportions of positive contributions to labour productivity growth across manufacturing industries**[1]

	Total number of observations (industry * year)	Entry contribution %	Exit contribution %	Between component %
Finland	420	57	93	62
France	126	47	81	40
Italy	348	84	89	85
Netherlands	344	76	77	51
Portugal	211	63	91	49
United Kingdom	392	62	92	45
United States	58	10	98	31

Panel B. **Proportions of positive contributions to labour productivity growth across business services**[1]

	Total number of observations (industry * year)	Entry contribution %	Exit contribution %	Between component %
Finland	24	50	79	46
western Germany	18	56	71	50
Italy	227	30	54	29
Portugal	191	39	66	43

Notes: These calculations are based on all available data with manufacturing and business services. The time periods considered vary considerably across countries.

1. Number of cases in wich the different components made a positive contribution to labour productivity growth (in % of total number of cases)

Source: OECD

Table 2. **Cross-country differences in hazard rates relative to the United States**
(with control for industry structure)

	Difference in hazard rate with respect to United States at duration (% points):	
	2 years	4 years
western Germany	7.3	-2.8
France	1.4	-5.6
Italy	-0.6	-2.4
United Kingdom	11.2	2.9
Finland	13.8	-8.0
Portugal	1.1	-4.5

Notes : The figures presented are the country-specific effects (relative to the U.S. coefficients) from a hazard regression that also includes control for industry-specific effects. See Bartelsman *et al.* (2002) for more details. The hazard rates are the estimated probabilities of exiting the market conditional on having survived for at least (2, 4) years.

Source: OECD

Table 3. **Variability of entry rates and hazard rates, 1989-94**
(Non-agricultural business sector, standard deviations of entry and hazard rates across industries)

	standard deviation of :							
	entry rates	**hazard rates** at duration:						
		1	2	3	4	5	6	7
United States	4.52	1.96	2.78	2.34	3.25	3.45	2.76	2.26
western Germany	2.77	3.98	3.54	3.53	2.57	3.51	2.08	3.29
France	5.29	2.68	3.14	4.12	3.18	2.91	3.52	7.8
Italy	4.98	2.99	2.23	3.33	4.48	2.19	2.59	4.15
United Kingdom	7.14	3.49	3.22	4.33	2.94	2.84	4.64	..
Finland	3.72	6.97	4.55	4.36	4.72	4.16	7.52	11.15
Portugal	6.37	8.72	8.95	9.63	4.07	4.39	6.9	8.27

Source: OECD

Table 4. **Entry rate regressions baseline specification** [1]
(dependent variable = entry rate)

	A		B		C		D		E	
	With year dummies		With gap variable for the cycle[2]		With both year dummies and variable for cycle		… also with control for outliers		Without size effects	
Constant	**3.40**	**	**2.72**	**	**3.36**	**	**3.79**	**	**5.26**	**
	(0.55)		*(0.24)*		*(0.55)*		*(0.42)*		*(0.64)*	
Country:										
western Germany	**-1.27**	**	**-1.37**	**	**-1.26**	**	**-1.38**	**	**-0.56**	**
	(0.18)		*(0.18)*		*(0.18)*		*(0.14)*		*(0.21)*	
France	**1.39**	**	**1.40**	**	**1.39**	**	**1.09**	**	**1.35**	**
	(0.15)		*(0.15)*		*(0.15)*		*(0.12)*		*(0.18)*	
Italy	**-0.54**	**	**-0.15**		**-0.54**	**	**-0.65**	**	**-0.34**	
	(0.16)		*(0.15)*		*(0.16)*		*(0.12)*		*(0.19)*	
United Kingdom	**1.99**	**	**2.17**	**	**2.02**	**	**1.58**	**	**1.84**	**
	(0.19)		*(0.18)*		*(0.19)*		*(0.14)*		*(0.22)*	
Denmark	**0.89**	**	**1.22**	**	**0.86**	**	**0.74**	**	**0.89**	**
	(0.18)		*(0.16)*		*(0.18)*		*(0.14)*		*(0.22)*	
Finland	**0.53**	**	**0.75**	**	**0.38**		**0.12**		**1.91**	**
	(0.16)		*(0.19)*		*(0.20)*		*(0.15)*		*(0.24)*	
Netherlands	**0.46**	**	**0.58**	**	**0.47**	**	**0.19**		**1.29**	**
	(0.14)		*(0.14)*		*(0.14)*		*(0.11)*		*(0.16)*	
Portugal	**1.79**	**	**1.89**	**	**1.79**	**	**1.26**	**	**3.03**	**
	(0.15)		*(0.14)*		*(0.15)*		*(0.12)*		*(0.18)*	
Size:										
less than 20	**7.38**	**	**7.39**	**	**7.38**	**	**6.97**	**		
	(0.10)		*(0.10)*		*(0.10)*		*(0.08)*			
50 - 99	**-0.40**	**	**-0.40**	**	**-0.40**	**	**-0.45**	**		
	(0.11)		*(0.11)*		*(0.11)*		*(0.09)*			
100 - 499	**-0.32**	**	**-0.32**	**	**-0.32**	**	**-0.48**	**		
	(0.11)		*(0.12)*		*(0.11)*		*(0.09)*			
500 and more	**0.001**		**-0.02**		**-0.004**		**-0.59**	**		
	(0.17)		*(0.17)*		*(0.17)*		*(0.13)*			

Notes: See Annex 2 for details on the definition of entry rates.
Robust standard errors are in brackets. * : significant at 5 % level; ** at 1% level.

1. The textile, footwear and leather products industry with 20-49 employees in the United States is the reference group in these equations.
2. Output gap from OECD Analytical Database (ADB).

Source: OECD

Table 5. **Entry rate regressions: the role of regulations and institutions**

	A	B	C	D	E	F	G	H
	2.86 **	**2.95** **	**3.05** **	**3.24** **	**3.28** **	**4.22** **	**4.30** **	**2.25** *
	(0.40)	*(0.41)*	*(0.42)*	*(0.41)*	*(0.41)*	*(0.56)*	*(0.56)*	*(0.89)*
ΔlogVA	**0.46**	**-3.49**	**-2.55**	**-2.66**	**-2.54**	**-2.73**	**-2.98**	**-3.40**
	(1.82)	*(1.97)*	*(1.93)*	*(1.94)*	*(1.94)*	*(1.93)*	*(1.93)*	*(1.96)*
ΔlogVA (less than 20)		**10.36** **	**11.21** **	**11.07** **	**11.07** **	**11.40** **	**11.96** **	**11.09** **
		(2.69)	*(2.82)*	*(2.81)*	*(2.82)*	*(2.79)*	*(2.77)*	*(2.66)*
LogKY	**-0.23**	**-0.20**	**-0.24**	**-0.27** *	**-0.28** *	**-0.31** *	**-0.34** **	**-0.29** *
	(0.13)	*(0.13)*	*(0.12)*	*(0.12)*	*(0.12)*	*(0.12)*	*(0.12)*	*(0.13)*
PM regulations (PMR)			**-0.15**					
			(0.10)					
PM (administrative regulations)				**-0.32** **				
				(0.06)				
PM (admin. barriers to start up) * size(less than 20)						**-0.70** **		
						(0.19)		
PM (admin. barriers to start up) * size(20-49)						**-0.60** **		
						(0.14)		
PM (admin. barriers to start up) * size(50-99)						**-0.25**		
						(0.13)		
PM (admin. barriers to start up) * size(100-499)						**0.03**		
						(0.10)		
PM (admin. barriers to start up) * size(500 and more)						**0.47** *		
						(0.24)		
PM (sector specific)					**-1.64** **			
					(0.38)			
PM (sector specific) * size(less than 20)							**-5.33** **	**-6.35** **
							(0.93)	*(1.05)*
PM (sector specific) * size(20-49)							**-3.95** **	**-2.70** **
							(0.77)	*(0.96)*
PM (sector specific) * size(50-99)							**-1.65** *	**-1.05**
							(0.75)	*(0.93)*
PM (sector specific) * size(100-499)							**0.83**	**2.53** **
							(0.58)	*(0.94)*
PM (sector specific) * size(500 and more)							**3.25** *	**-2.32**
							(1.35)	*(1.94)*
EPL * size(less than 20)								**0.23**
								(0.12)
EPL * size(20-49)								**-0.28** **
								(0.10)
EPL * size(50-99)								**-0.13**
								(0.10)
EPL * size(100-499)								**0.07**
								(0.34)
EPL * size(500 and more)								**0.87** **
								(0.20)
Number of observations	3197	3196	3196	3196	3196	3198	3198	3196
Country dummies	Yes	Yes	No	No	No	No	No	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Size dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: See Annex 2 for details on the definition of entry rates.
Robust standard errors are in brackets. * : significant at 5 % level; ** at 1% level.
Source: OECD

Table 6. **Productivity regressions: the Role of Regulations and Institutions**

	A	B	C	D	E	F	G	H	I	J
Constant	**-0.002**	**-0.004**	**-0.004**	**-0.004**	**-0.019** *	**-0.018** *	**-0.015**	**-0.015**	**-0.026** **	**-0.026** **
	(0.010)	*(0.010)*	*(0.010)*	*(0.010)*	*(0.011)*	*(0.010)*	*(0.011)*	*(0.011)*	*(0.011)*	*(0.011)*
Δ $TFP_{Leader\ j\ t}$ (MAN)	**-0.013**	**-0.013**	**-0.013**	**-0.013**	**-0.012**	**-0.012**	**-0.012**	**-0.012**	**-0.012**	**-0.012**
	(0.009)	*(0.009)*	*(0.009)*	*(0.009)*	*(0.009)*	*(0.009)*	*(0.009)*	*(0.009)*	*(0.008)*	*(0.008)*
Δ $TFP_{Leader\ j\ t}$ (SERV)	**0.082** ***	**0.085** ***	**0.081** ***	**0.084** ***	**0.079** ***	**0.098** ***	**0.079** ***	**0.078** ***	**0.081** ***	**0.080** ***
	(0.013)	*(0.013)*	*(0.014)*	*(0.013)*	*(0.014)*	*(0.014)*	*(0.015)*	*(0.014)*	*(0.018)*	*(0.018)*
$RTFP_{i\ j\ t-1}$(MAN)	**-0.023** ***	**-0.023** ***	**-0.024** ***	**-0.024** ***	**-0.048** ***	**-0.045** ***	**-0.042** ***	**-0.047** ***	**-0.042** ***	**-0.046** ***
	(0.004)	*(0.004)*	*(0.005)*	*(0.005)*	*(0.009)*	*(0.008)*	*(0.008)*	*(0.012)*	*(0.009)*	*(0.011)*
$RTFP_{i\ j\ t-1}$ (SERV)	**-0.048** ***	**-0.049** ***	**-0.047** ***	**-0.048** ***	**-0.073** ***	**-0.060** ***	**-0.064** ***	**-0.070** ***	**-0.064** ***	**-0.066** ***
	(0.008)	*(0.008)*	*(0.008)*	*(0.008)*	*(0.011)*	*(0.009)*	*(0.010)*	*(0.013)*	*(0.013)*	*(0.013)*
PM regulations (PMR)	**-0.007** ***				**0.004**					
	(0.002)				*(0.003)*					
PMR (sectoral)		**-0.030** **				**0.023**				
		(0.012)				*(0.015)*				
PMR (economic regulation)			**-0.004** ***				**0.002**			
			(0.001)				*(0.002)*			
PMR (time-varying)				**-0.003** ***				**-0.0004**		
				(0.001)				*(0.001)*		
PMR * $RTFP_{i\ j\ t-1}$					**0.016** ***				**0.009** *	
					(0.005)				*(0.006)*	
PMR (sectoral) * $RTFP_{i\ j\ t-1}$						**0.086** ***				
						(0.027)				
PMR (econ. reg.) * $RTFP_{i\ j\ t-1}$							**0.009** ***			
							(0.003)			
PMR (time-varying) * $RTFP_{i\ j\ t-1}$								**0.005** **		**0.004** *
								(0.002)		*(0.002)*
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	No	No	No	No	No	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3191	3191	3191	3191	3191	3191	3191	3191	3191	3191

Notes: In all equations with (time invariant) product market regulatory indicators, standard errors are adjusted for cluster level effects.
Robust standard errors are in brackets. * : significant at 10 % level; ** at 5% level; *** at 1 % level.

Source: OECD

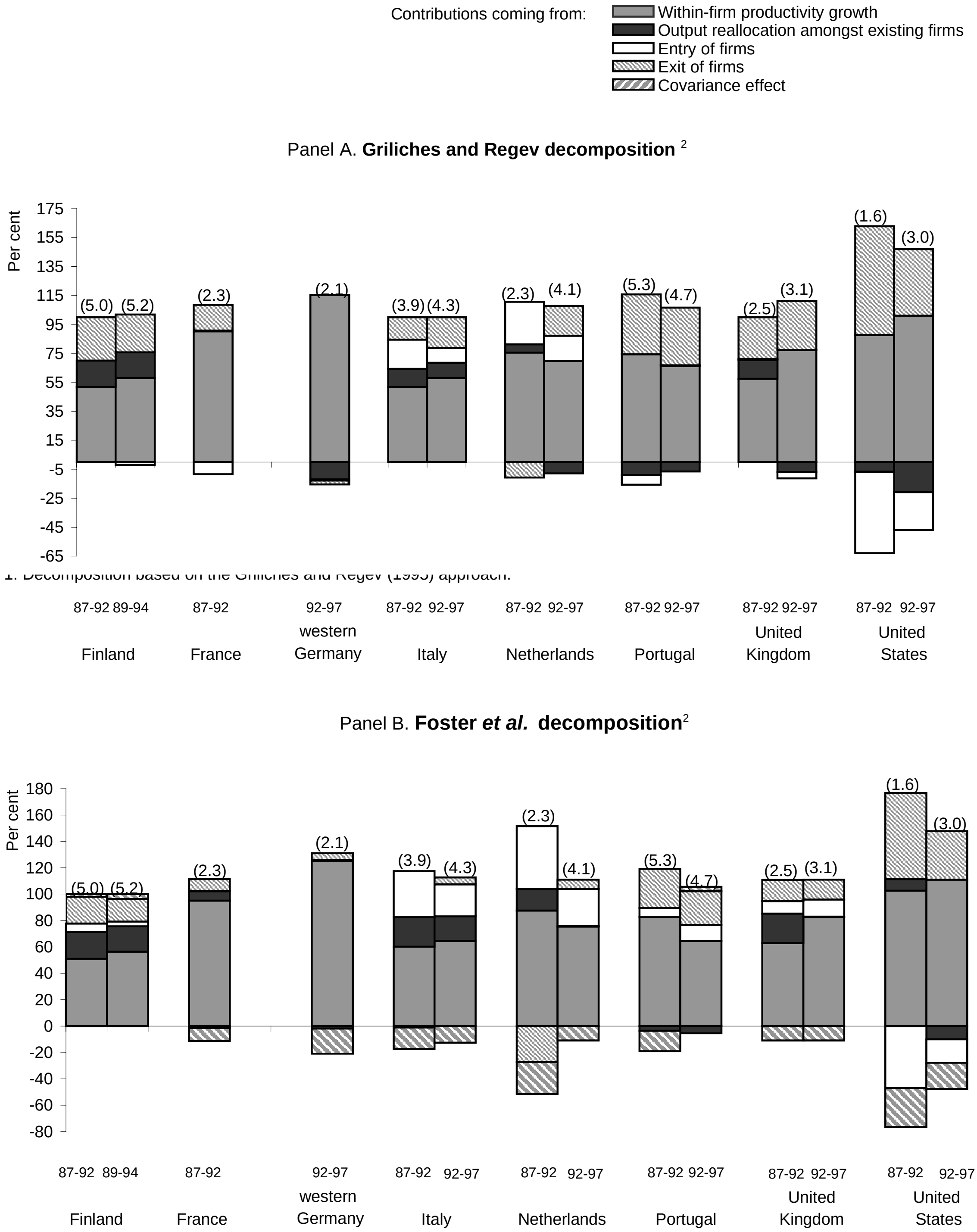
Table 6. **Productivity regressions: the Role of Regulations and Institutions** (continued)

	K	L	M	N	O	P	Q	R	S	T
Constant	**-0.008**	**-0.012**	**-0.018**	**-0.018**	**-0.010**	**-0.001**	**-0.010**	**-0.011**	**-0.011**	**-0.014**
	(0.010)	*(0.010)*	*(0.013)*	*(0.011)*	*(0.012)*	*(0.013)*	*(0.010)*	*(0.010)*	*(0.009)*	*(0.009)*
Δ $TFP_{Leader\ j\ t}$ (MAN)	**-0.013**	**-0.012**	**-0.012**	**-0.012**	**-0.012**	**-0.012**	**-0.012**	**-0.012**	**-0.012**	**-0.012**
	(0.009)	*(0.009)*	*(0.009)*	*(0.009)*	*(0.009)*	*(0.009)*	*(0.009)*	*(0.009)*	*(0.009)*	*(0.009)*
Δ $TFP_{Leader\ j\ t}$ (SERV)	**0.085** ***	**0.083** ***	**0.078** ***	**0.093** ***	**0.077** ***	**0.074** ***	**0.078** ***	**0.090** ***	**0.077** ***	**0.075** ***
	(0.013)	*(0.014)*	*(0.015)*	*(0.015)*	*(0.015)*	*(0.014)*	*(0.014)*	*(0.014)*	*(0.015)*	*(0.014)*
$RTFP_{i\ j\ t-1}$(MAN)	**-0.024** ***	**-0.023** ***	**-0.042** ***	**-0.040** ***	**-0.036** ***	**-0.041** ***	**-0.037** ***	**-0.035** ***	**-0.037** ***	**-0.047** ***
	(0.005)	*(0.005)*	*(0.009)*	*(0.008)*	*(0.008)*	*(0.012)*	*(0.007)*	*(0.007)*	*(0.007)*	*(0.011)*
$RTFP_{i\ j\ t-1}$ (SERV)	**-0.049** ***	**-0.049** ***	**-0.067** ***	**-0.057** ***	**-0.058** ***	**-0.062** ***	**-0.062** ***	**-0.055** ***	**-0.058** ***	**-0.069** ***
	(0.008)	*(0.008)*	*(0.012)*	*(0.009)*	*(0.010)*	*(0.013)*	*(0.010)*	*(0.009)*	*(0.009)*	*(0.012)*
High corporatism		**-0.002**	**-0.001**	**-0.002**	**-0.001**	**-0.003**	**-0.002**	**-0.002**	**-0.001**	**-0.002**
		(0.003)	*(0.003)*	*(0.003)*	*(0.003)*	*(0.003)*	*(0.003)*	*(0.003)*	*(0.003)*	*(0.003)*
Low corporatism		**-0.001**	**-0.001**	**-0.001**	**-0.002**	**-0.007** *	**-0.002**	**-0.002**	**-0.002**	**-0.004**
		(0.003)	*(0.003)*	*(0.003)*	*(0.003)*	*(0.004)*	*(0.003)*	*(0.003)*	*(0.003)*	*(0.003)*
EPL (high corporatism)		**-0.002**	**-0.002**	**-0.002**	**-0.002**	**-0.001**	**-0.001**	**-0.001**	**-0.002**	**-0.002**
		(0.003)	*(0.003)*	*(0.003)*	*(0.003)*	*(0.003)*	*(0.003)*	*(0.003)*	*(0.003)*	*(0.003)*
EPL (medium corporatism)		**-0.010** ***	**-0.008** ***	**-0.008** ***	**-0.008** ***	**-0.007** ***	**-0.007** ***	**-0.008** ***	**-0.008** ***	**-0.009** ***
		(0.002)	*(0.002)*	*(0.002)*	*(0.002)*	*(0.002)*	*(0.002)*	*(0.002)*	*(0.002)*	*(0.002)*
EPL (low corporatism)		**0.0005**	**0.001**	**0.001**	**0.003**	**0.004** *	**0.002**	**0.002**	**0.003** *	**0.002**
		(0.001)	*(0.002)*	*(0.002)*	*(0.002)*	*(0.002)*	*(0.001)*	*(0.001)*	*(0.001)*	*(0.001)*
EPL	**-0.002** **									
	(0.001)									
PM regulations (PMR)			**0.004**							
			(0.004)							
PMR (sectoral)				**0.023**						
				(0.018)						
PMR (economic regulation)					**-0.0002**					
					(0.003)					
PMR (time-varying)						**-0.003**				
						(0.002)				
PMR * $RTFP_{i\ j\ t-1}$			**0.012** **				**0.009** **			
			(0.005)				*(0.004)*			
PMR (sectoral) * $RTFP_{i\ j\ t-1}$				**0.064** **				**0.047** **		
				(0.027)				*(0.022)*		
PMR (econ. reg.) * $RTFP_{i\ j\ t-1}$					**0.006** **				**0.007** **	
					(0.003)				*(0.003)*	
PMR (time-varying) * $RTFP_{i\ j\ t-1}$						**0.004** *				**0.005** **
						(0.002)				*(0.002)*
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	No	No	No	No	No	No	No
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3191	3191	3191	3191	3191	3191	3191	3191	3191	3191

Notes: In all equations with (time invariant) product market regulatory indicators, standard errors are adjusted for cluster level effects.
Robust standard errors are in brackets. * : significant at 10 % level; ** at 5% level; *** at 1 % level.

Source: OECD

Figure 1. **Decomposition of labour productivity growth in manufacturing**
Percentage share of total annual productivity growth of each component[1]



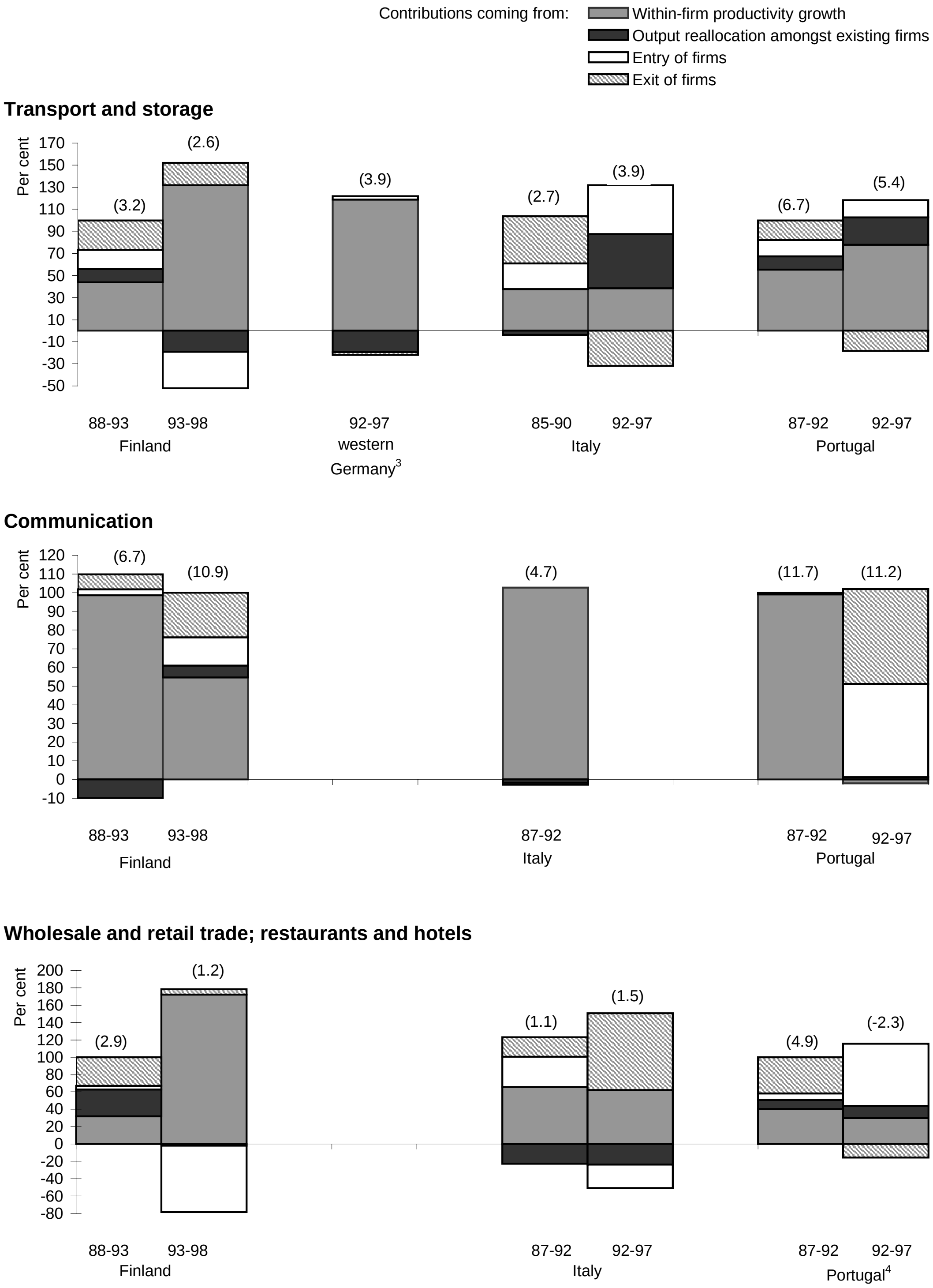
Note: Figures in brakets are overall productivity growth rates (annual percentage change).

1. Components may not add up to 100 because of rounding.
2. See main text for details.

Source: OECD.

Figure 2. **Decomposition of labour productivity growth in selected service sectors**[1]

Percentage share of total annual productivity growth of each component [2]

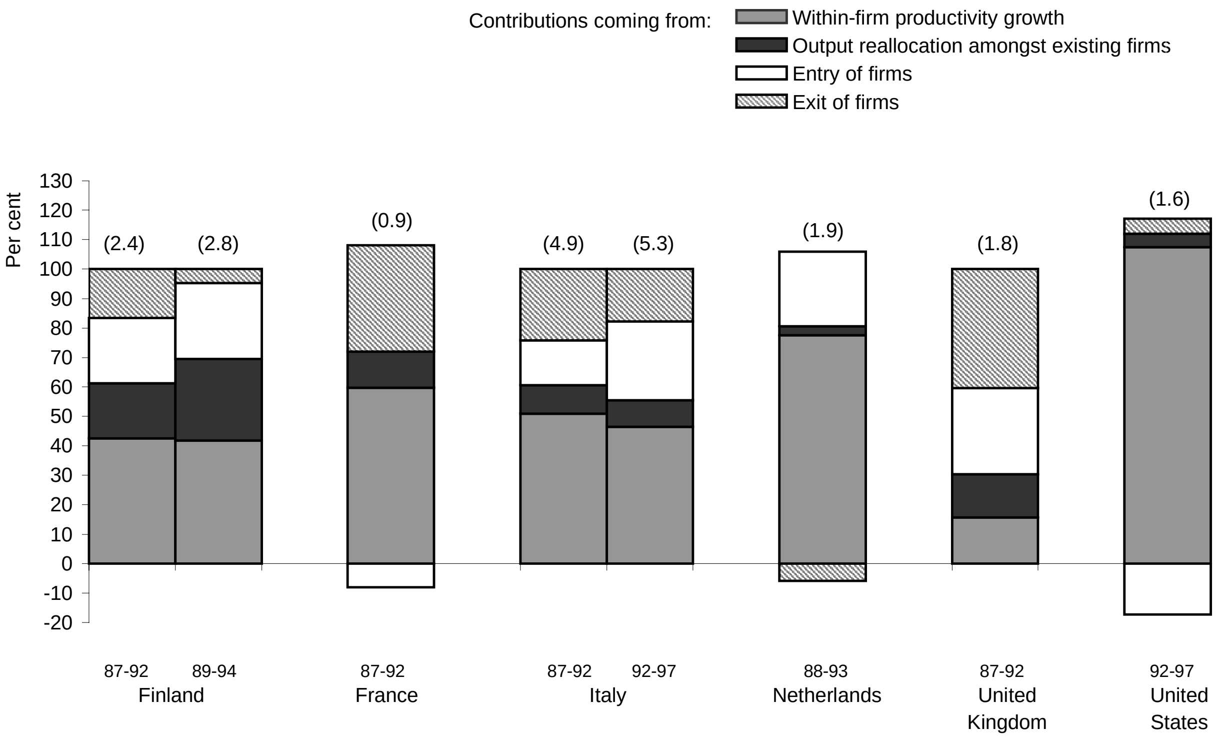


Note: Figures in brackets are overall productivity growth rates (annual percentage change).

1. Decomposition based on the Griliches and Regev (1995) approach.
2. Components may not add up to 100 because of rounding.
3. Transport, storage and communication.
4. Wholesale and retail trade.

Source: OECD.

Figure 3. **Decomposition of multifactor productivity growth in manufacturing** [1]
Percentage share of total annual productivity growth of each component [2]

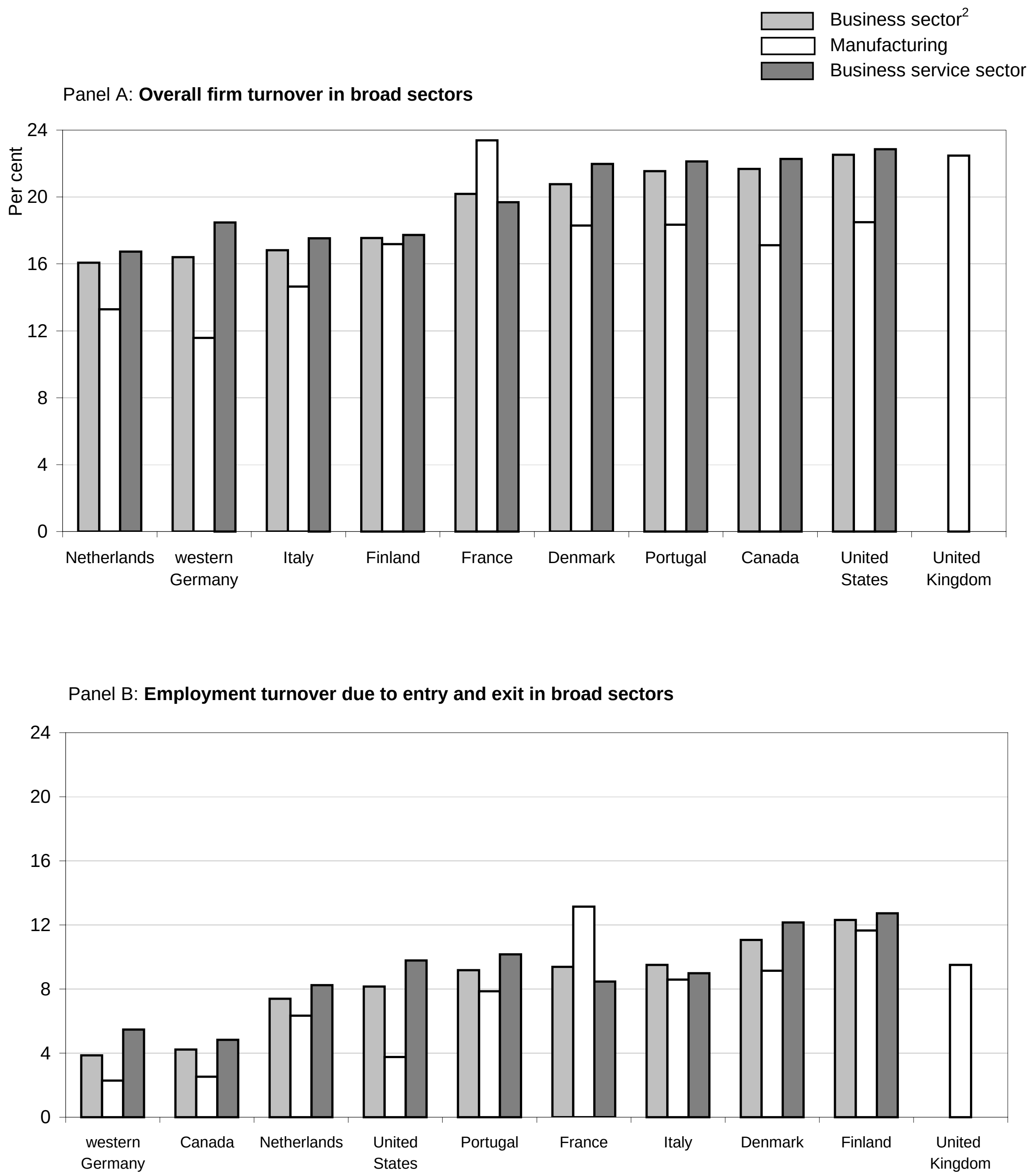


Note: Figures in brackets are overall productivity growth rates (annual percentage change).

1. Decomposition based on the Griliches and Regev (1995) approach.
2. Components may not add up to 100 because of rounding.

Source: OECD.

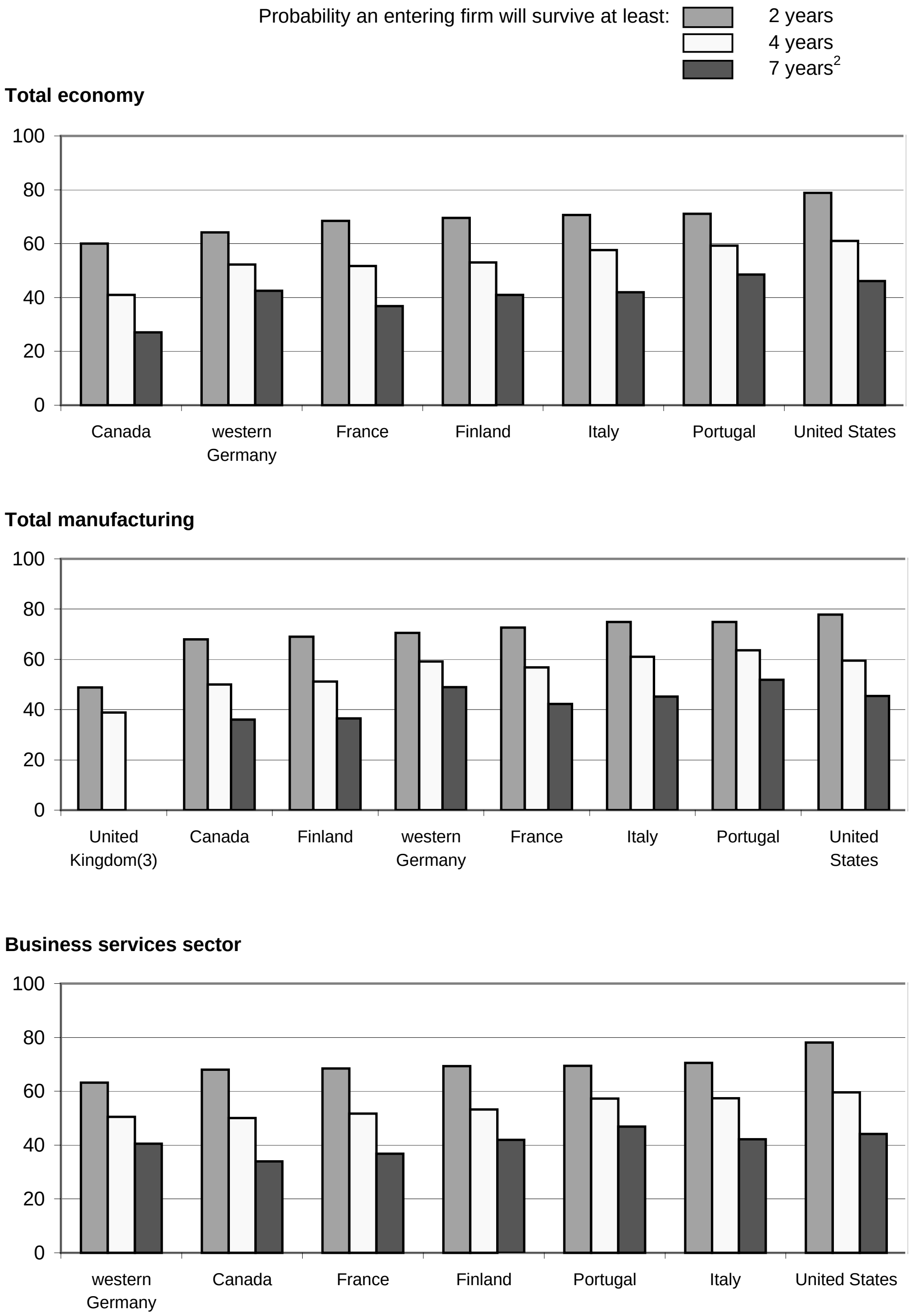
Figure 4. **Turnover rates in OECD countries, 1989-94**
(entry and exit rates, annual average)[1]



1. The entry rate is the ratio of entering firms to the total population. The exit rate is the ratio of exiting firms to the population of origin. Turnover rates are the sum of entry and exit rates.
2. Total economy minus agriculture and community services.

Source: OECD

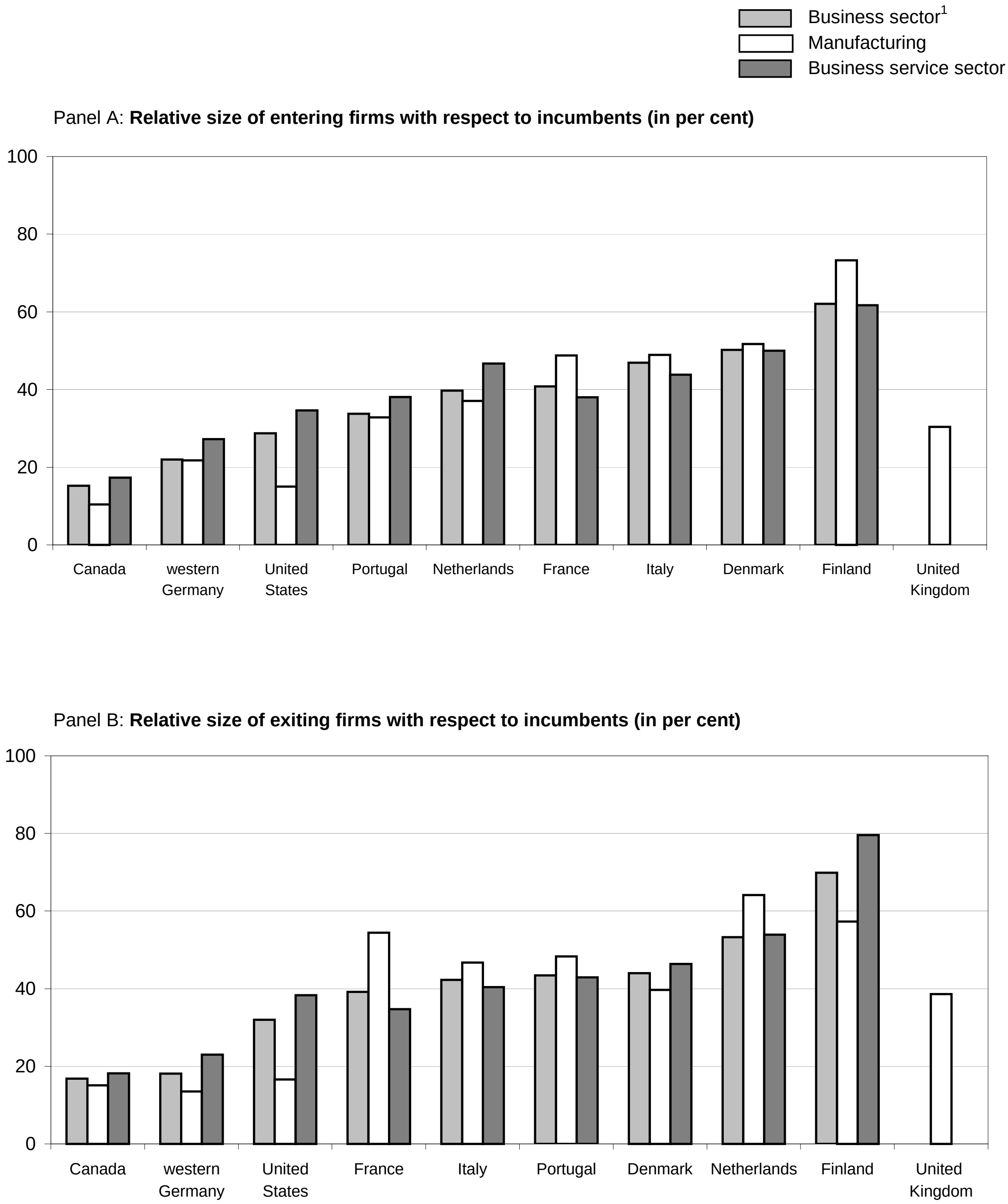
Figure 5. **Firm survivor rates at different lifetimes [1]**



1. Figures refer to average survivor rates estimated for different cohorts of firms that entered the market from the late 1980s to the 1990s.
2. After 6 years for the United Kingdom.
3. Data for the United Kingdom refer to cohorts of firms that entered the market in the 1985-90 period.

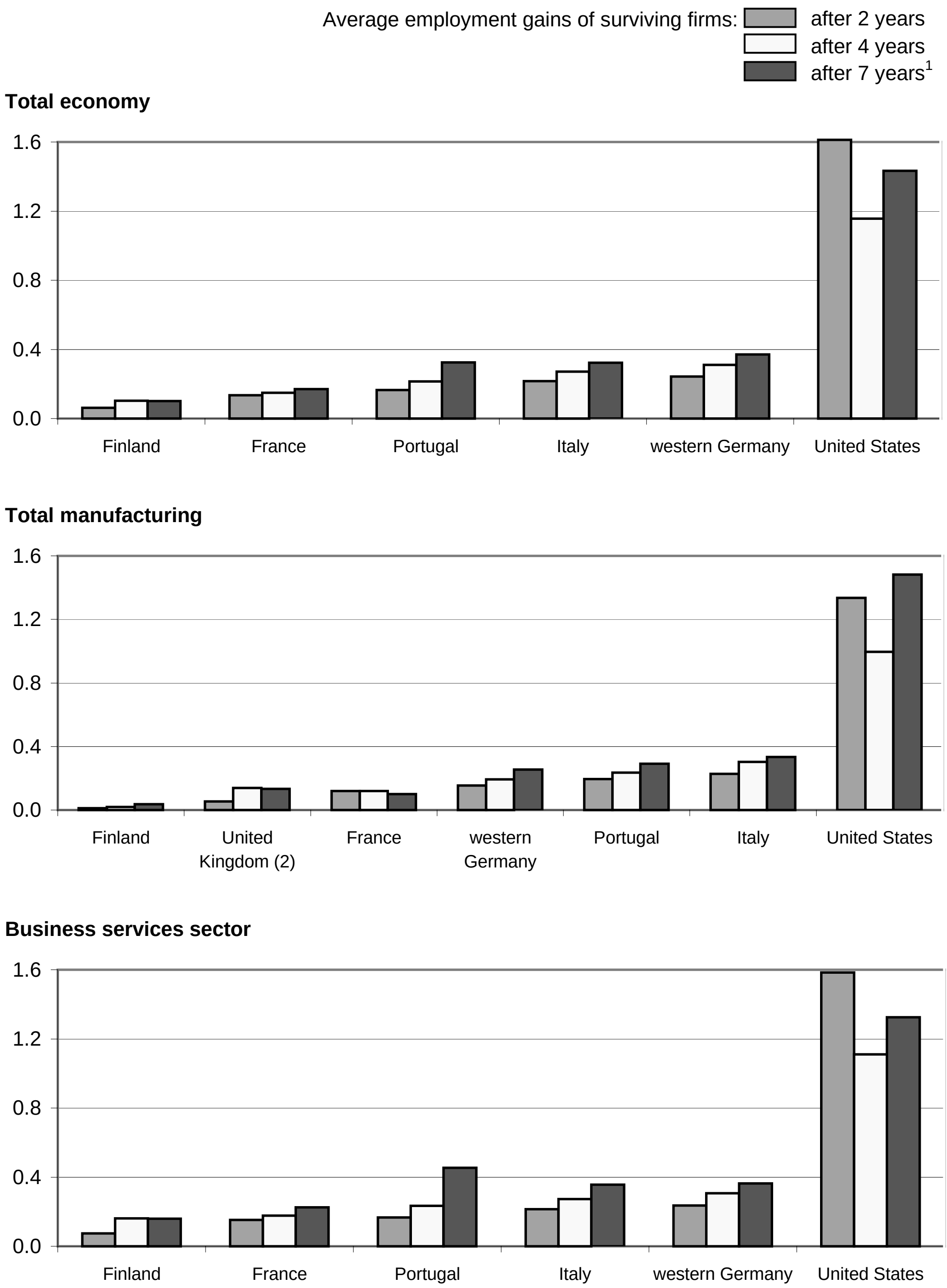
Sources: OECD, and Baldwin *et al.* (2000) for Canada.

Figure 6. **Average firm size of entering and exiting firms, 1989-94**
(firm size based on the number of employees per firm)



1. Total economy minus agriculture and community services.
Source: OECD

Figure 7. **Net employment gains among surviving firms at different lifetimes, 1990s**
(net gains as a ratio of initial employment)



1. After 6 years for the United Kingdom.
2. Data for the United Kingdom refer to cohorts of firms that entered the market in the 1985-90 period.

Sources: OECD

Table A1. **Labour productivity decompositions**
Finland, average period: 1987-92
decomposition based on the Griliches and Regev (1995) approach

Industries	Productivity Growth (annual % change)	Decomposition				
		Within	Between	Net Entry	of wich Entry	Exit
Total manufacturing	5.0	2.6	0.9	1.5	0.0	1.5
Food products beverages and tobacco	4.4	3.4	0.1	1.0	0.3	0.7
Textiles textile products leather and footwear	3.1	0.0	0.8	2.3	0.1	2.2
Wood and products of wood and cork	4.8	3.5	0.3	1.0	0.2	0.8
Pulp paper paper products printing and publishing	4.9	3.1	0.7	1.0	-0.2	1.2
Chemical rubber plastics and fuel products	4.0	3.4	0.0	0.6	0.1	0.5
Chemical and fuel products	2.8	3.3	-1.2	0.7	0.3	0.5
Coke refined petroleum products and nuclear fuel	4.4	7.3	-0.9	..	-2.0	..
Chemicals and chemical products	3.2	2.7	-0.1	0.6	0.4	0.2
Chemicals excluding pharmaceuticals	3.2	2.5	-0.0	0.7	0.3	0.4
Pharmaceuticals	3.5	3.4	-0.2	0.3	0.6	-0.4
Rubber and plastics products	4.3	3.6	0.3	0.5	0.2	0.3
Other non-metallic mineral products	2.4	1.5	0.2	0.7	0.5	0.3
Basic metals metal products machinery and equipment	4.6	2.7	0.8	1.1	-0.0	1.1
Basic metals metal products machinery and equipment excl. transport	4.6	2.5	0.9	1.2	-0.0	1.2
Basic metals and fabricated metal products	4.9	2.8	1.2	1.0	-0.4	1.4
Basic metals	6.3	3.8	1.4	1.1	0.2	0.8
Fabricated metal products excl. machinery and equipment	2.7	2.0	0.1	0.6	-0.4	1.0
Machinery and equipment	4.4	2.4	0.8	1.2	0.2	1.1
Machinery and equipment n.e.c.	1.8	0.5	0.5	0.8	-0.1	0.9
Electrical and optical equipment	7.8	4.9	1.1	1.8	0.4	1.5
Office accounting and computing machinery	9.6	3.0	0.4	6.2	4.7	1.6
Electrical machinery and apparatus n.e.c.	7.5	4.0	0.8	2.7	0.8	1.9
Radio television and communication equipment	8.1	6.6	1.2	0.2	0.0	0.2
Medical precision and optical instruments	5.7	4.8	0.3	0.6	-0.1	0.7
Transport equipment	4.4	3.5	0.3	0.6	-0.2	0.8
Motor vehicles trailers and semi-trailers	3.4	1.6	0.5	1.3	-0.4	1.7
Other transport equipment	4.9	4.5	0.1	0.2	-0.0	0.3
Building and repairing of ships and boats	5.7	4.6	0.3	0.7	-0.2	0.9
Railroad equipment and transport equipment n.e.c.	2.1	4.2	-0.4	-1.7	0.6	-2.3
Manufacturing n.e.c.; recycling	3.3	2.0	0.3	1.0	0.3	0.7

Table A1. **Labour productivity decompositions** (continued)

Finland, average period: 1989-94

decomposition based on the Griliches and Regev (1995) approach

Industries	Productivity Growth (annual % change)	Decomposition				
		Within	Between	Net Entry	of wich Entry	Exit
Total manufacturing	5.2	3.0	0.9	1.3	-0.1	1.4
Food products beverages and tobacco	5.0	3.8	0.4	0.8	0.2	0.6
Textiles textile products leather and footwear	5.8	2.5	0.8	2.5	0.2	2.3
Wood and products of wood and cork	4.7	3.7	0.0	1.0	0.2	0.9
Pulp paper paper products printing and publishing	6.0	3.8	1.0	1.2	-0.1	1.3
Chemical rubber plastics and fuel products	3.4	2.9	-0.2	0.7	0.1	0.6
Chemical and fuel products	3.2	2.8	-0.5	0.9	0.4	0.5
Coke refined petroleum products and nuclear fuel	6.4	6.5	-0.1	-0.0	-1.3	1.3
Chemicals and chemical products	2.4	2.4	-0.6	0.6	0.3	0.3
Chemicals excluding pharmaceuticals	4.0	3.7	-0.5	0.8	0.2	0.6
Pharmaceuticals	-3.1	-2.4	-0.4	-0.3	-0.0	-0.3
Rubber and plastics products	3.6	3.0	0.3	0.3	-0.1	0.4
Other non-metallic mineral products	2.2	1.8	-0.4	0.8	0.6	0.3
Basic metals metal products machinery and equipment	4.4	2.8	1.1	0.6	-0.4	1.0
Basic metals metal products machinery and equipment excl. transport	4.7	2.9	1.3	0.5	-0.5	1.0
Basic metals and fabricated metal products	4.5	2.6	1.2	0.7	-0.7	1.4
Basic metals	4.4	3.3	0.9	0.2	-0.2	0.4
Fabricated metal products excl. machinery and equipment	2.7	2.2	-0.2	0.6	-0.3	0.9
Machinery and equipment	4.9	3.0	1.4	0.5	-0.3	0.8
Machinery and equipment n.e.c.	1.7	0.7	0.6	0.4	-0.4	0.8
Electrical and optical equipment	8.5	5.8	2.1	0.6	-0.2	0.9
Office accounting and computing machinery	9.0	4.9	2.6	1.5	0.3	1.2
Electrical machinery and apparatus n.e.c.	5.6	3.8	1.1	0.7	-0.3	1.0
Radio television and communication equipment	12.2	9.4	1.4	1.3	-0.7	2.0
Medical precision and optical instruments	4.3	3.4	0.2	0.7	0.2	0.5
Transport equipment	2.4	1.7	-0.1	0.8	-0.1	0.9
Motor vehicles trailers and semi-trailers	-0.5	-0.4	-0.8	0.6	-0.2	0.8
Other transport equipment	4.2	2.8	0.5	1.0	0.1	0.9
Building and repairing of ships and boats	5.5	4.4	-0.0	1.1	-0.0	1.2
Railroad equipment and transport equipment n.e.c.	-1.0	-2.6	1.0	0.6	-0.1	0.7
Manufacturing n.e.c.; recycling	3.0	1.7	0.4	1.0	0.3	0.7

Table A1. **Labour productivity decompositions** (continued)
France, average period: 1987-92
decomposition based on the Griliches and Regev (1995) approach

Industries	Productivity Growth (annual % change)	Decomposition				
		Within	Between	Net Entry	of wich Entry	Exit
Total manufacturing	2.3	2.0	0.0	0.2	-0.2	0.4
Food products beverages and tobacco	2.6	2.4	-0.3	0.4	0.2	0.2
Textiles textile products leather and footwear	1.8	1.5	0.3	-0.1	-0.8	0.7
Wood and products of wood and cork	1.9	1.6	0.6	-0.3	-0.1	-0.2
Pulp paper paper products printing and publishing	2.3	1.3	0.2	0.8	0.4	0.4
Chemical and fuel products	2.6	2.0	0.2	0.4	0.2	0.3
Coke refined petroleum products and nuclear fuel	-1.1	-0.9	-0.3	0.1	-0.1	0.2
Chemicals and chemical products	3.0	2.3	0.3	0.4	0.2	0.2
Chemicals excluding pharmaceuticals	2.3	1.9	0.1	0.4	0.3	0.1
Pharmaceuticals	4.2	3.0	0.7	0.5	0.1	0.4
Rubber and plastics products	2.4	1.7	0.5	0.2	0.3	-0.1
Other non-metallic mineral products	0.6	1.2	-0.4	-0.2	-0.1	-0.1
Basic metals metal products machinery and equipment excl. transport	1.3	2.0	-0.2	-0.4	-0.1	-0.3
Basic metals and fabricated metal products	-0.1	1.7	-0.4	-1.4	-0.4	-1.0
Machinery and equipment	2.4	2.2	-0.1	0.4	0.2	0.3
Machinery and equipment n.e.c.	2.4	2.1	-0.1	0.4	0.2	0.2
Electrical and optical equipment	2.5	2.3	-0.1	0.4	0.1	0.3
Electrical machinery and apparatus n.e.c.	2.6	2.0	-0.0	0.7	0.5	0.2
Radio television and communication equipment	2.9	3.1	-0.3	0.1	-0.4	0.5
Medical precision and optical instruments	2.4	1.7	-0.1	0.9	0.3	0.6
Transport equipment	3.2	3.2	-0.3	0.3	-0.3	0.5
Motor vehicles trailers and semi-trailers	3.5	3.2	-0.1	0.4	-0.3	0.6
Other transport equipment	2.6	3.1	-0.6	0.1	-0.1	0.2
Manufacturing n.e.c.; recycling	2.7	1.8	0.1	0.8	0.6	0.2

Table A1. **Labour productivity decompositions** (continued)

Italy, average period: 1987-92

decomposition based on the Griliches and Regev (1995) approach

Industries	Productivity Growth (annual % change)	Decomposition				
		Within	Between	Net Entry	of wich Entry	Exit
Total manufacturing	3.9	2.0	0.5	1.4	0.8	0.6
Food products beverages and tobacco	5.1	2.6	0.3	2.3	0.8	1.5
Textiles textile products leather and footwear	3.8	1.7	0.7	1.5	1.3	0.2
Wood and products of wood and cork	4.5	3.4	0.3	0.8	0.6	0.2
Pulp paper paper products printing and publishing	2.7	2.1	0.3	0.3	0.6	-0.3
Chemical rubber plastics and fuel products	4.6	2.2	0.6	1.8	0.8	1.0
Coke refined petroleum products and nuclear fuel	-3.1	-1.7	0.1	-1.5	-1.5	-0.1
Chemicals and chemical products	5.5	2.6	0.7	2.2	1.1	1.1
Chemicals excluding pharmaceuticals	4.8	1.4	0.7	2.6	1.4	1.2
Pharmaceuticals	6.7	4.8	0.6	1.3	0.7	0.7
Rubber and plastics products	4.0	2.1	0.4	1.5	0.5	1.0
Other non-metallic mineral products	4.5	2.8	0.1	1.6	0.4	1.3
Basic metals metal products machinery and equipment	3.5	1.9	0.4	1.3	0.6	0.7
Basic metals and fabricated metal products	4.1	2.2	0.4	1.5	1.0	0.5
Basic metals	4.7	2.0	0.6	2.2	1.1	1.1
Fabricated metal products excl. machinery and equipment	3.9	2.3	0.4	1.2	0.6	0.6
Machinery and equipment	4.1	2.7	0.0	1.5	0.9	0.6
Machinery and equipment n.e.c.	2.9	1.4	0.4	1.0	0.2	0.8
Electrical and optical equipment	5.2	3.7	-0.4	1.9	1.5	0.4
Transport equipment	1.5	-0.3	1.2	0.6	-0.2	0.9
Motor vehicles trailers and semi-trailers	-1.1	-2.2	0.9	0.2	-0.3	0.5
Other transport equipment	5.4	3.3	0.6	1.6	1.0	0.6
Building and repairing of ships and boats	7.8	6.3	0.6	0.9	0.7	0.3
Aircraft and spacecraft	3.0	2.5	-0.2	0.7	0.7	0.0
Manufacturing n.e.c.; recycling	4.7	2.4	0.5	1.7	0.8	0.9

Table A1. **Labour productivity decompositions** (continued)
Italy, average period: 1992-97
decomposition based on the Griliches and Regev (1995) approach

Industries	Productivity Growth (annual % change)	Decomposition				
		Within	Between	Net Entry	of wich Entry	of wich Exit
Total manufacturing	4.3	2.5	0.5	1.3	0.4	0.9
Food products beverages and tobacco	1.2	1.0	0.5	-0.4	-0.2	-0.1
Textiles textile products leather and footwear	5.2	2.2	0.8	2.2	0.8	1.4
Wood and products of wood and cork	3.8	1.9	0.4	1.6	-0.0	1.6
Pulp paper paper products printing and publishing	4.6	2.5	0.4	1.7	1.1	0.6
Chemical rubber plastics and fuel products	3.1	1.6	0.5	1.0	0.5	0.6
Coke refined petroleum products and nuclear fuel	7.3	2.3	2.7	2.2	-1.6	3.9
Chemicals and chemical products	4.0	1.2	0.8	2.0	0.7	1.3
Chemicals excluding pharmaceuticals	5.5	1.5	1.0	2.9	1.2	1.8
Pharmaceuticals	1.6	0.6	0.5	0.5	-0.1	0.5
Rubber and plastics products	3.5	2.2	0.3	1.1	0.4	0.7
Other non-metallic mineral products	3.7	1.6	0.5	1.6	0.5	1.1
Basic metals metal products machinery and equipment	4.7	3.2	0.3	1.2	0.4	0.8
Basic metals and fabricated metal products	4.6	2.7	0.1	1.7	0.6	1.2
Basic metals	6.4	3.1	0.0	3.3	1.1	2.2
Fabricated metal products excl. machinery and equipment	4.2	2.4	0.1	1.6	0.4	1.2
Machinery and equipment	4.8	3.4	0.4	1.0	0.4	0.6
Machinery and equipment n.e.c.	4.4	2.7	0.2	1.6	0.5	1.0
Electrical and optical equipment	5.3	4.3	0.5	0.5	0.3	0.3
Transport equipment	4.6	2.9	0.1	1.7	0.2	1.5
Motor vehicles trailers and semi-trailers	-1.1	-2.2	0.9	0.2	-0.3	0.5
Other transport equipment	5.4	3.3	0.6	1.6	1.0	0.6
Building and repairing of ships and boats	7.8	6.3	0.6	0.9	0.7	0.3
Aircraft and spacecraft	3.0	2.5	-0.2	0.7	0.7	0.0
Manufacturing n.e.c.; recycling	4.7	2.4	0.5	1.7	0.8	0.9

Table A1. **Labour productivity decompositions** (continued)
Netherlands, average period: 1987-92
decomposition based on the Griliches and Regev (1995) approach

Industries	Productivity Growth (annual % change)	Decomposition				
		Within	Between	Net Entry	of wich Entry	Exit
Total manufacturing	2.3	1.8	0.1	0.4	0.7	-0.3
Food products beverages and tobacco	1.7	0.9	0.2	0.6	0.1	0.5
Textiles textile products leather and footwear	2.5	1.2	0.7	0.6	0.5	0.1
Wood and products of wood and cork	0.7	0.4	0.1	0.2	0.3	-0.2
Pulp paper paper products printing and publishing	1.8	1.3	0.2	0.4	0.6	-0.2
Chemical and fuel products	2.4	1.5	0.0	0.9	0.8	0.1
Chemical rubber plastics and fuel products	1.9	1.5	0.2	0.3	1.1	-0.8
Chemicals and chemical products	2.6	1.4	0.4	0.9	1.0	-0.1
Chemicals excluding pharmaceuticals	2.6	1.4	0.4	0.9	1.0	-0.1
Rubber and plastics products	1.9	1.2	0.5	0.3	0.4	-0.1
Other non-metallic mineral products	2.4	1.9	-0.1	0.6	0.3	0.3
Basic metals metal products machinery and equipment excl. transport	2.6	2.7	-0.5	0.4	0.1	0.4
Basic metals and fabricated metal products	1.6	0.5	0.2	0.9	0.5	0.4
Basic metals metal products machinery and equipment	3.0	2.4	-0.4	1.0	0.6	0.3
Fabricated metal products excl. machinery and equipment	1.6	0.9	0.2	0.6	0.1	0.5
Machinery and equipment n.e.c.	2.4	1.5	0.2	0.6	0.6	0.1
machinery and equipment	3.2	3.8	-0.8	0.2	-0.1	0.3
Electrical and optical equipment	4.2	5.0	-0.7	-0.1	-0.4	0.3
Electrical machinery and apparatus n.e.c.	2.6	1.9	0.1	0.6	-0.1	0.7
Radio television and communication equipment	6.0	7.0	-0.3	-0.7	-0.7	0.0
Medical precision and optical instruments	2.9	0.3	0.0	2.5	2.2	0.3
Transport equipment	4.7	0.9	0.1	3.7	3.0	0.7
Motor vehicles trailers and semi-trailers	..	..	..	..	..	..
Other transport equipment	4.7	0.9	0.1	3.7	3.0	0.7
Building and repairing of ships and boats	..	..	..	..	..	..
Manufacturing n.e.c.; recycling	1.4	1.2	0.1	0.1	-1.5	1.7

Table A1. **Labour productivity decompositions** (continued)

Netherlands, average period: 1992-97

decomposition based on the Griliches and Regev (1995) approach

Industries	Productivity Growth (annual % change)	Decomposition			of wich	
		Within	Between	Net Entry	Entry	Exit
Total manufacturing	4.1	2.8	-0.3	1.5	0.7	0.8
Food products beverages and tobacco	3.1	2.6	-0.4	0.9	0.8	0.1
Textiles textile products leather and footwear	5.7	2.2	0.4	3.1	1.2	1.9
Wood and products of wood and cork	4.6	1.6	0.2	2.8	0.5	2.3
Pulp paper paper products printing and publishing	3.5	2.2	-0.0	1.3	0.6	0.7
Chemical and fuel products	6.0	5.8	-1.6	1.7	0.9	0.9
Chemical rubber plastics and fuel products	5.3	5.0	-1.4	1.8	0.8	1.0
Chemicals and chemical products	6.2	6.1	-1.8	1.9	1.2	0.7
Chemicals excluding pharmaceuticals	6.5	6.0	-1.7	2.2	1.2	1.0
Rubber and plastics products	4.2	2.7	0.1	1.4	1.1	0.3
Other non-metallic mineral products	3.5	2.5	0.3	0.8	0.0	0.8
Basic metals metal products machinery and equipment excl. transport	4.2	3.0	0.1	1.1	-0.0	1.1
Basic metals and fabricated metal products	3.9	3.2	-0.1	0.8	0.1	0.7
Basic metals metal products machinery and equipment	4.0	2.5	0.1	1.3	0.7	0.7
Fabricated metal products excl. machinery and equipment	3.6	2.3	0.0	1.3	0.5	0.8
Machinery and equipment n.e.c.	5.0	3.2	0.5	1.3	0.5	0.8
machinery and equipment	4.4	2.9	0.3	1.3	-0.1	1.4
Electrical and optical equipment	4.3	2.6	0.2	1.5	-0.3	1.8
Electrical machinery and apparatus n.e.c.	5.8	2.9	0.5	2.4	0.1	2.2
Radio television and communication equipment	2.0	1.0	-0.1	1.0	-0.2	1.2
Medical precision and optical instruments	6.6	5.1	0.6	0.9	0.4	0.6
Transport equipment	3.0	-0.1	-0.3	3.4	3.7	-0.2
Motor vehicles trailers and semi-trailers	6.1	-2.2	2.1	..	6.2	..
Other transport equipment	0.3	1.4	-0.4	-0.7	0.3	-1.0
Building and repairing of ships and boats	3.9	2.4	0.7	..	0.7	..
Manufacturing n.e.c.; recycling	4.2	2.3	0.1	1.9	0.8	1.1

Table A1. **Labour productivity decompositions** (continued)

Portugal, average period: 1987-92

decomposition based on the Griliches and Regev (1995) approach

Industries	Productivity Growth (annual % growth)	Decomposition				
		Within	Between	Net Entry	of wich Entry	Exit
Total manufacturing	5.3	4.0	-0.5	1.8	-0.4	2.2
Food products beverages and tobacco	3.9	2.2	1.2	0.6	-0.5	1.0
Textiles textile products leather and footwear	5.8	4.2	0.1	1.5	-0.6	2.1
Wood and products of wood and cork	5.6	3.2	0.4	2.1	-0.1	2.1
Pulp paper paper products printing and publishing	6.3	4.2	-0.1	2.2	0.1	2.2
Chemical rubber plastics and fuel products	4.6	6.3	-3.3	1.5	0.5	1.1
Chemical and fuel products	5.1	8.1	-3.7	0.6	0.6	0.0
Chemicals and chemical products	5.2	8.2	-3.7	0.6	0.6	0.0
Chemicals excluding pharmaceuticals	5.1	9.9	-4.3	-0.5	-0.5	-0.0
Pharmaceuticals	6.4	5.8	-0.4	1.0	0.7	0.4
Rubber and plastics products	5.5	1.4	1.1	3.0	0.0	3.0
Other non-metallic mineral products	7.9	4.7	0.5	2.7	1.2	1.6
Basic metals metal products machinery and equipment	4.8	2.9	-0.1	2.1	0.2	1.9
Basic metals metal products machinery and equipment excl. transport	4.0	3.0	-0.3	1.4	0.2	1.1
Basic metals and fabricated metal products	3.5	2.8	-0.1	0.9	-0.1	1.0
Basic metals	3.5	3.9	-1.0	0.5	-0.4	1.0
Fabricated metal products excl. machinery and equipment	4.0	2.4	0.6	1.1	0.2	0.9
Machinery and equipment	4.0	3.3	-0.7	1.4	0.3	1.2
Machinery and equipment n.e.c.	7.0	3.3	1.2	2.5	0.7	1.8
Electrical and optical equipment	1.0	3.7	-2.6	-0.1	-0.4	0.3
Office accounting and computing machinery	7.9	4.7	0.2	3.0	0.4	2.6
Electrical machinery and apparatus n.e.c.	-3.8	3.4	-4.3	-2.9	-3.6	0.7
Radio television and communication equipment	5.6	4.4	-0.9	2.1	1.8	0.3
Medical precision and optical instruments	-2.3	-0.6	-0.3	-1.3	-1.5	0.2
Transport equipment	7.4	2.2	1.0	4.3	0.2	4.0
Motor vehicles trailers and semi-trailers	3.9	3.1	1.0	-0.2	-1.7	1.5
Other transport equipment	8.8	1.6	0.5	6.7	2.4	4.3
Building and repairing of ships and boats	9.7	-2.0	0.4	11.3	3.9	7.4
Railroad equipment and transport equipment n.e.c.	7.8	6.4	0.7	0.8	1.4	-0.6
Manufacturing n.e.c.; recycling	6.1	4.4	0.3	1.4	-0.2	1.5

Table A1. **Labour productivity decompositions** (continued)

Portugal, average period: 1992-97

decomposition based on the Griliches and Regev (1995) approach

Industries	Productivity Growth (annual % growth)	Decomposition				
		Within	Between	Net Entry	of wich	
					Entry	Exit
Total manufacturing	4.7	3.1	-0.3	1.9	0.0	1.9
Food products beverages and tobacco	-2.4	1.3	-1.9	..	-1.8	..
Textiles textile products leather and footwear	4.7	3.0	0.2	1.5	-0.5	2.0
Wood and products of wood and cork	-0.4	-3.3	0.6	2.4	-0.5	2.8
Pulp paper paper products printing and publishing	0.8	0.4	0.1	0.3	1.4	-1.1
Chemical rubber plastics and fuel products	2.9	2.9	-0.4	0.4	-1.0	1.3
Chemical and fuel products	2.7	2.7	-0.7	0.7	-1.3	2.1
Chemicals and chemical products	3.4	3.4	-0.8	0.7	-1.3	2.0
Chemicals excluding pharmaceuticals	0.6	2.9	-0.9	-1.4	-2.0	0.6
Pharmaceuticals	5.8	2.8	0.5	2.5	-0.7	3.2
Rubber and plastics products	4.3	3.1	1.0	0.3	-0.1	0.4
Other non-metallic mineral products	6.0	3.3	0.0	2.6	0.4	2.2
Basic metals metal products machinery and equipment	8.7	6.2	-0.7	3.2	1.8	1.4
Basic metals metal products machinery and equipment excl. transport	7.9	5.9	-0.2	2.1	1.0	1.1
Basic metals and fabricated metal products	7.1	4.2	0.2	2.7	1.6	1.1
Basic metals	4.2	0.2	-0.4	4.4	3.8	0.6
Fabricated metal products excl. machinery and equipment	8.8	5.7	0.3	2.8	1.3	1.5
Machinery and equipment	8.1	7.2	-0.7	1.6	0.7	0.9
Machinery and equipment n.e.c.	6.6	5.3	0.1	1.2	0.2	1.0
Electrical and optical equipment	8.6	8.5	-1.5	1.7	1.0	0.7
Electrical machinery and apparatus n.e.c.	10.1	9.3	-2.0	2.8	0.5	2.2
Radio television and communication equipment	8.8	7.2	-0.8	2.4	1.5	0.8
Medical precision and optical instruments	9.7	7.6	-0.3	2.4	0.5	1.8
Transport equipment	12.8	7.6	-1.7	6.9	4.3	2.6
Motor vehicles trailers and semi-trailers	13.6	7.5	-3.2	9.2	6.0	3.2
Other transport equipment	7.4	8.9	-0.3	-1.2	-0.3	-0.9
Building and repairing of ships and boats	8.4	21.1	-8.9	-3.8	-0.4	-3.5
Railroad equipment and transport equipment n.e.c.	1.4	3.8	-0.3	-2.1	-0.5	-1.6
Manufacturing n.e.c.; recycling	-9.7	-7.4	-0.1	-2.2	-2.2	-0.0

Table A1. **Labour productivity decompositions** (continued)

United Kingdom, average period: 1987-92

decomposition based on the Griliches and Regev (1995) approach

Industries	Productivity Growth (annual % change)	Decomposition				
		Within	Between	Net Entry	of wich Entry	Exit
Total manufacturing	2.5	1.5	0.3	0.8	0.0	0.7
Food products beverages and tobacco	1.2	1.5	-0.1	-0.3	-0.6	0.3
Textiles textile products leather and footwear	2.8	1.6	0.1	1.1	-0.1	1.1
Wood and products of wood and cork	-0.9	-0.4	-0.7	0.2	0.1	0.1
Pulp paper paper products printing and publishing	3.1	1.7	0.2	1.2	0.1	1.1
Chemical rubber plastics and fuel products	1.2	1.4	-0.3	0.1	-0.0	0.1
Chemical and fuel products	2.3	1.8	-0.6	1.1	0.9	0.2
Chemicals and chemical products	2.5	1.8	-0.6	1.3	0.9	0.3
Chemicals excluding pharmaceuticals	2.0	1.5	-0.7	1.2	0.8	0.4
Pharmaceuticals	4.0	2.6	0.1	1.3	1.1	0.2
Rubber and plastics products	0.5	0.7	0.2	-0.4	-0.7	0.3
Other non-metallic mineral products	0.2	-0.4	0.3	0.3	0.8	-0.5
Basic metals metal products machinery and equipment	2.8	1.7	0.5	0.6	0.0	0.6
Basic metals metal products machinery and equipment excl. transport	2.9	1.7	0.4	0.8	0.2	0.7
Basic metals and fabricated metal products	1.2	1.1	-0.2	0.4	-0.5	0.8
Basic metals	2.8	2.2	-0.4	1.0	0.1	0.9
Fabricated metal products excl. machinery and equipment	1.1	0.4	0.1	0.6	-0.4	1.0
Machinery and equipment	3.7	2.0	0.7	1.1	0.5	0.6
Machinery and equipment n.e.c.	2.0	1.5	-0.1	0.6	0.0	0.6
Electrical and optical equipment	4.8	2.3	1.2	1.4	0.8	0.5
Office accounting and computing machinery	7.8	0.9	3.2	3.7	2.7	1.0
Electrical machinery and apparatus n.e.c.	3.4	2.6	0.3	0.5	0.3	0.2
Radio television and communication equipment	4.1	2.7	0.9	0.5	-0.1	0.7
Medical precision and optical instruments	3.4	2.4	0.2	0.8	-0.0	0.8
Transport equipment	2.8	1.7	0.8	0.3	-0.4	0.7
Motor vehicles trailers and semi-trailers	1.4	0.6	0.5	0.2	-0.6	0.8
Other transport equipment	3.3	3.0	0.5	-0.2	0.2	-0.4
Building and repairing of ships and boats	6.3	4.5	0.7	1.2	0.6	0.7
Aircraft and spacecraft	2.6	2.6	0.0	0.1	0.2	-0.1
Railroad equipment and transport equipment n.e.c.	3.9	3.3	0.4	0.1	0.2	-0.0
Manufacturing n.e.c.; recycling	0.7	0.4	0.3	-0.0	-0.5	0.5

Table A1. **Labour productivity decompositions** (continued)

United Kingdom, average period: 1992-97

decomposition based on the Griliches and Regev (1995) approach

Industries	Productivity Growth (annual % change)	Decomposition				
		Within	Between	Net Entry	of wich	
					Entry	Exit
Total manufacturing	3.1	2.4	-0.2	0.9	-0.1	1.1
Food products beverages and tobacco	-1.0	0.4	-0.8	-0.6	-0.2	-0.4
Textiles textile products leather and footwear	2.8	2.2	-0.5	1.1	0.2	1.0
Wood and products of wood and cork	2.2	1.5	0.9	-0.2	-1.2	1.0
Pulp paper paper products printing and publishing	0.5	1.3	-0.2	-0.7	-1.6	0.9
Chemical rubber plastics and fuel products	1.3	2.5	-0.6	-0.6	-0.9	0.3
Chemical and fuel products	1.6	3.0	-0.4	-1.0	-1.1	0.2
Chemicals and chemical products	2.1	3.0	-0.4	-0.5	-1.0	0.5
Chemicals excluding pharmaceuticals	1.5	3.1	-0.8	-0.7	-1.3	0.6
Pharmaceuticals	3.4	2.9	0.7	-0.1	-0.3	0.2
Rubber and plastics products	1.2	1.8	-0.2	-0.4	-0.7	0.2
Other non-metallic mineral products	2.4	1.8	-0.3	0.9	0.7	0.2
Basic metals metal products machinery and equipment	5.4	3.5	0.1	1.8	0.2	1.6
Basic metals metal products machinery and equipment excl. transport	5.2	3.0	0.3	1.8	0.7	1.1
Basic metals and fabricated metal products	3.1	2.4	0.2	0.6	-0.9	1.5
Basic metals	4.4	3.0	-0.1	1.5	-0.2	1.7
Fabricated metal products excl. machinery and equipment	1.8	1.9	-0.0	-0.1	-0.7	0.5
Machinery and equipment	6.0	3.3	0.4	2.3	1.3	1.0
Machinery and equipment n.e.c.	3.8	2.8	0.1	0.9	0.0	0.9
Electrical and optical equipment	7.4	3.7	0.6	3.2	2.1	1.1
Office accounting and computing machinery	14.9	4.6	-0.1	10.4	5.6	4.8
Electrical machinery and apparatus n.e.c.	6.0	3.8	-0.1	2.4	0.7	1.7
Radio television and communication equipment	8.6	4.0	1.0	3.7	1.7	2.0
Medical precision and optical instruments	2.8	2.7	-0.1	0.1	0.2	-0.1
Transport equipment	6.3	4.5	-0.2	1.9	-0.5	2.4
Motor vehicles trailers and semi-trailers	4.9	4.8	-0.6	0.7	-1.0	1.7
Other transport equipment	7.6	4.2	-0.0	3.4	0.8	2.6
Building and repairing of ships and boats	4.1	3.8	0.1	0.2	-1.0	1.2
Aircraft and spacecraft	9.2	4.9	-0.1	4.5	1.8	2.7
Railroad equipment and transport equipment n.e.c.	2.0	0.6	0.6	0.9	-1.1	2.0
Manufacturing n.e.c.; recycling	2.0	0.8	0.3	0.9	-0.4	1.3

Table A1. **Labour productivity decompositions** (continued)
United States, average period: 1987-92
decomposition based on the Griliches and Regev (1995) approach

Industries	Productivity Growth (annual % change)	Decomposition				
		Within	Between	Net Entry	of wich Entry	Exit
Total manufacturing	1.6	1.4	-0.1	0.3	-0.9	1.2
Food products beverages and tobacco	0.6	0.7	-0.4	0.3	-0.4	0.7
Textiles textile products leather and footwear	1.4	0.7	0.7	-0.0	-1.4	1.4
Wood and products of wood and cork	-1.2	-0.8	0.3	-0.6	-0.7	0.1
Pulp paper paper products printing and publishing	0.2	0.3	0.1	-0.2	-0.8	0.6
Coke refined petroleum products and nuclear fuel	2.1	1.2	0.8	0.2	0.1	0.0
Chemicals and chemical products	0.6	1.1	-0.4	-0.2	-0.7	0.6
Rubber and plastics products	1.6	1.4	-0.0	0.3	-0.4	0.6
Other non-metallic mineral products	0.5	0.6	-0.3	0.2	-0.6	0.8
Basic metals	1.2	0.8	-0.2	0.5	-0.2	0.7
Fabricated metal products excl. machinery and equipment	0.7	0.3	0.3	0.1	-0.3	0.4
Machinery and equipment n.e.c.	1.2	1.1	-0.1	0.3	-0.3	0.6
Office accounting and computing machinery	11.2	9.0	-0.7	2.9	0.7	2.2
Electrical machinery and apparatus n.e.c.	4.2	3.4	0.0	0.8	-0.3	1.1
Radio television and communication equipment	6.8	4.6	0.4	1.7	0.1	1.7
Medical precision and optical instruments	3.0	2.7	-0.1	0.3	-0.4	0.8
Motor vehicles trailers and semi-trailers	1.7	2.2	-0.9	0.4	-0.8	1.2
Building and repairing of ships and boats	-0.2	-0.6	0.3	0.1	-1.0	1.0
Aircraft and spacecraft	3.0	3.0	0.2	-0.2	-0.3	0.2
Railroad equipment and transport equipment n.e.c.	3.2	2.5	-0.2	1.0	-0.2	1.1
Manufacturing n.e.c.; recycling	1.3	0.4	0.3	0.6	-0.3	0.9

Table A1. **Labour productivity decompositions** (continued)
United States, average period: 1992-97
decomposition based on the Griliches and Regev (1995) approach

Industries	Productivity Growth (annual % change)	Decomposition				
		Within	Between	Net Entry	of wich Entry	Exit
Total manufacturing	3.0	3.0	-0.6	0.6	-0.8	1.4
Food products beverages and tobacco	0.8	2.1	-1.3	-0.1	-1.1	1.0
Textiles textile products leather and footwear	4.2	2.4	0.6	1.2	-1.2	2.5
Wood and products of wood and cork	-0.3	-0.4	0.4	-0.3	-0.8	0.5
Pulp paper paper products printing and publishing	0.9	1.0	-0.3	0.2	-0.6	0.7
Coke refined petroleum products and nuclear fuel	6.7	6.2	0.3	0.3	-0.2	0.4
Chemicals and chemical products	2.9	3.3	-0.7	0.2	-0.2	0.4
Rubber and plastics products	2.3	2.1	-0.1	0.4	-0.4	0.8
Other non-metallic mineral products	2.3	1.8	-0.1	0.6	-0.4	1.0
Basic metals	2.4	3.1	-1.0	0.4	-0.2	0.6
Fabricated metal products excl. machinery and equipment	2.1	2.0	-0.2	0.3	-0.2	0.5
Machinery and equipment n.e.c.	3.0	2.7	-0.1	0.3	-0.4	0.7
Office accounting and computing machinery	18.7	16.3	0.0	2.4	0.5	1.9
Electrical machinery and apparatus n.e.c.	4.5	3.0	-0.3	1.8	1.0	0.8
Radio television and communication equipment	13.0	11.7	-0.5	1.7	0.0	1.7
Medical precision and optical instruments	3.7	3.3	-0.5	0.9	-0.0	0.9
Motor vehicles trailers and semi-trailers	2.9	4.3	-1.6	0.2	-0.8	1.1
Building and repairing of ships and boats	-0.6	0.2	-1.0	0.2	-0.9	1.1
Aircraft and spacecraft	2.9	2.2	0.0	0.6	-0.3	0.9
Railroad equipment and transport equipment n.e.c.	2.5	2.3	0.0	0.3	-0.5	0.8
Manufacturing n.e.c.; recycling	0.1	0.6	-0.8	0.3	-0.7	1.0

Figure A1. **The evolution of labour productivity and its components, total manufacturing**

Decomposition based on Griliches and Regev (1995) approach

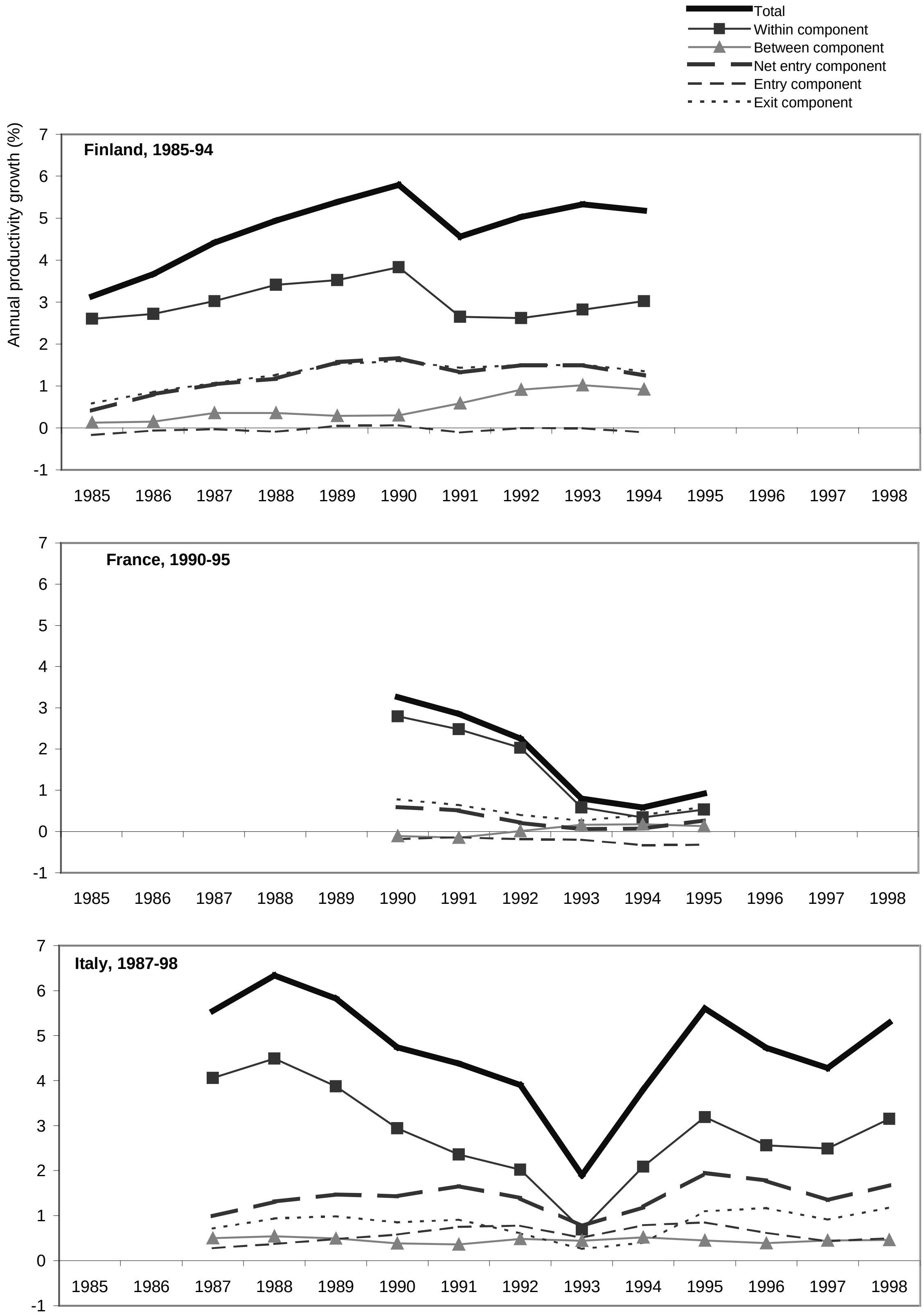
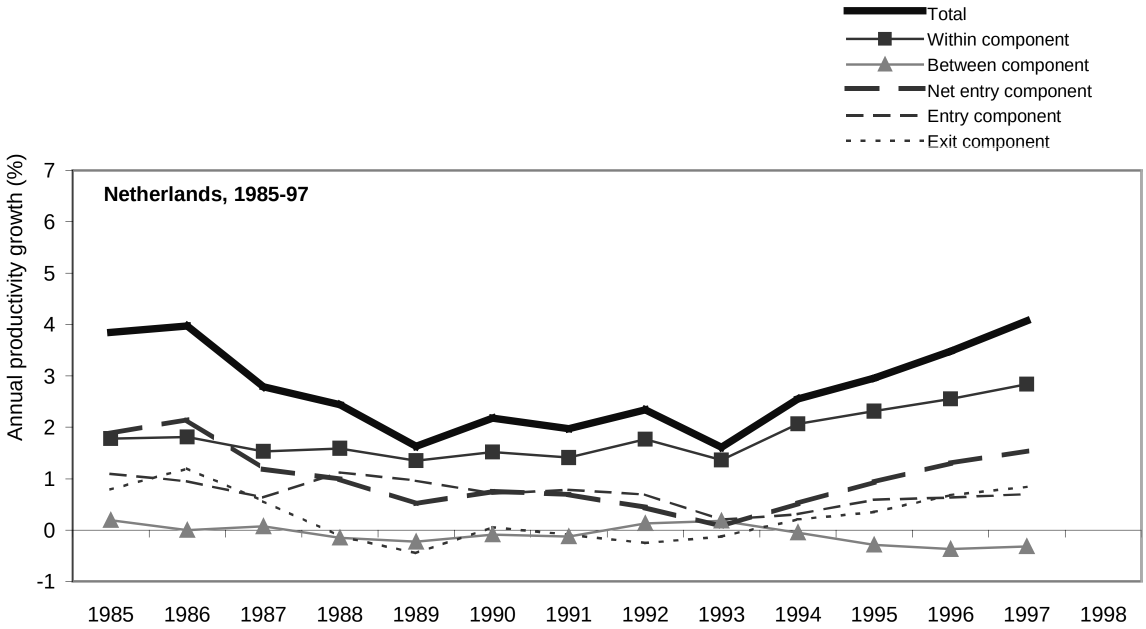
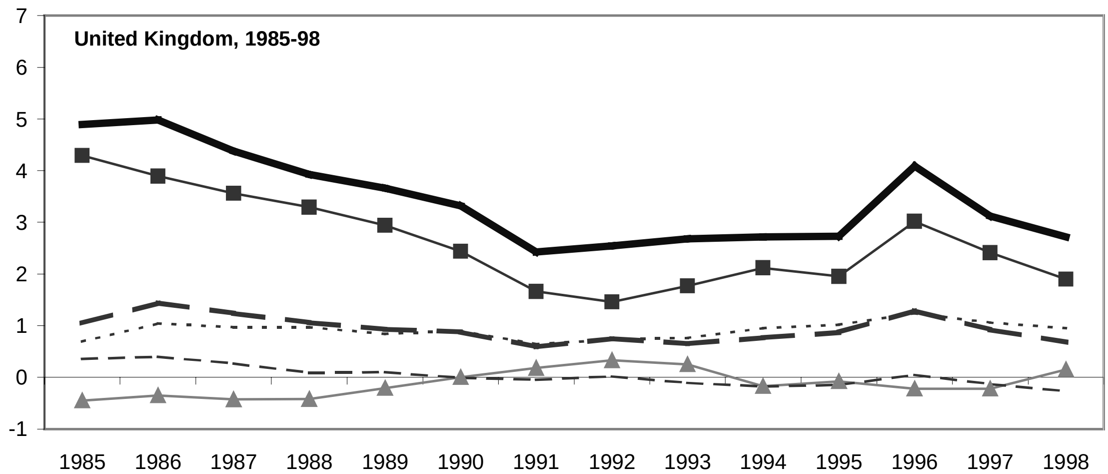


Figure A2. **The evolution of labour productivity and its components, total manufacturing** (continued)
Decomposition based on Griliches and Regev (1995) approach





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