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Job Turnover in Irish Manufacturing 1972-2006

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Abstract

While growth in output and employment remains relatively strong in the Irish economy, there has been considerable focus recently on some high-profile job losses, particularly in the manufacturing sector. This paper places these developments within a broader context and shows that aggregate changes in the net number of jobs arise from large numbers of firms both increasing and decreasing employment simultaneously at all points in time. Even at the height of the Celtic Tiger boom when employment grew by 8 percent, this was the result of 15 percent growth in jobs by expanding firms offset by 7 percent of positions being eliminated in firms that were contracting their workforces.

One important feature of job flows is that they may contribute to productivity growth by allowing movements from low to high productivity firms. To a degree, this reflects the re-allocation of jobs from declining sectors to expanding sectors, but this is not a comprehensive explanation. A significant factor underlying job flows is the reallocation within sectors from under-performing firms to expanding firms. This study also shows that productivity growth is, on balance, positive for employment growth, as it results, more often than not, in increased employment and higher earnings rather than job losses. On the other hand, these calculations also show how hard it is for policy-makers to identify firms that will be employment and productivity growth winners.

Non-Technical Summary

Net changes in employment are the result of many individual firm-level decisions to expand or contract. As a consequence, aggregate changes in employment conceal a significant amount of turnover as jobs are simultaneously created and destroyed. Using firm-level data over time gives us additional information on employment dynamics, and gives a better indication of the amount of structural change the economy is undergoing. For example, even at the height of the Celtic Tiger boom when employment in our sample of firms was growing by 8 percent, the decomposition of data shows that this was the result of 15 percent growth in jobs by expanding firms offset by 7 percent of positions being eliminated in firms that were contracting. Averaging over the entire period, we find that one in ten jobs are newly created every year and one in twelve are destroyed.

That jobs are being created and destroyed at the same time, even in years of very high growth, partly reflects the re-allocation of employment from contracting sectors such as textiles to expanding sectors such as financial services. This is not a complete explanation, however, as even within any individual sector we also observe jobs being created and destroyed at all points in time.

This study shows that Irish rates of job creation and destruction are not unusual by international standards and in the manufacturing sector are very similar to those found by previous research in the US. The results are also broadly consistent with an EU cross-country study, which showed that Ireland was one of a group of countries (including Italy, Spain and Sweden) that exhibited high rates of job creation and destruction, and, that during the 1990s, Ireland had the highest net job growth rate.

The data show a negative relationship between establishment size and the rate at which jobs are created and destroyed, with smaller units both creating and destroying jobs at higher rates than larger ones. On average, over the sample period, establishments in every size group added more jobs than they eliminated, as would be expected given the considerable economic expansion of recent years. These findings may reflect the fact that

small firms are learning about their market and their competitiveness, and are, therefore, more vulnerable to surprises than larger, more established firms. In this context, it should be pointed out that, although small establishments account for a very large proportion of the total population of firms, their contribution to total employment is much smaller. One-fifth of job creation came from the setting up of new establishments, whereas one-third of job destruction came from firms shutting down. The contribution of entry and exit is surprisingly high given that, on average, in any year just 8 percent of firms are new entrants and 6 percent have exited.

Examining patterns of job growth and decline seen over time, we try to estimate the extent to which firms future employment growth can be predicted on the basis of their past record of employment changes. On average, 31 percent of establishments grew in two consecutive three-year periods and 22 percent continued to contract their employment. This leaves 47 percent that reversed their performance of the previous period, demonstrating the considerable difficulty involved in predicting which firms will be successful in increasing employment over even relatively short time horizons.

In general we find that labour productivity was positively related to employment growth (higher productivity firms are more likely to create more jobs). This fits with the predictions of economic theory that job turnover facilitates productivity improvements by allowing movement from low to high productivity firms, both within and between sectors.

1. Introduction

Net changes in employment are the result of many individual firm-level decisions to expand or contract in response to a wide variety of changes in the market environment. These include the emergence and spread of new products and technologies, marketing campaigns by the individual firm, learning by doing by both managers and workers, the costs of hiring, training and firing workers, etc. As a consequence, figures on aggregate changes in employment conceal a significant amount of turnover as jobs are created and destroyed, with many of these additions and subtractions of jobs canceling one another out in the statistics for total employment growth. To give an illustration of how job flows may give a deeper perspective on what is happening in the labour market, consider a net employment growth rate of 4%. This aggregate figure could be arrived at from a job creation rate of 12% and job destruction rate of 8% or from a combination of a job creation rate of 5% and a job destruction rate of 1%.

In some respects the first part of this paper updates Barry *et al* (1998) by adding an additional 12 years of data, a period which covers the Celtic Tiger era, the 2001 "dot-com" collapse and the start of current economic slowdown. It provides a comprehensive picture of job flows in the Irish economy using a detailed firm-level data set, covering manufacturing and internationally traded services sectors. This data set allows us to follow individual firms over time, and to decompose aggregate job changes into that part due to some firms adding jobs and another part due to some firms shedding jobs. The second part of this paper makes two further contributions to the study of job flows in Ireland. The first issue we test is whether it is possible to spot patterns in the data that can help to differentiate between those firms that will have a tendency to grow and create jobs from those that will be liable to contract. In addition a further analysis is conducted on how job gains and losses are linked with changes in the pattern of firm level productivity.

The main finding from this detailed data set is that underlying the aggregate figures for changes in the number of jobs, there are very large numbers of firms both increasing and decreasing employment. These increases and decreases in employment at individual firms occur simultaneously at all points in time. For example, even at the height of the

Celtic Tiger boom when employment in our sample of firms was growing by 8 percent, the decomposition of data shows that this was the result of 15 percent growth in jobs by expanding firms offset by 7 percent of positions being eliminated in contracting firms. The calculations also show how difficult it is for policy-makers to select those firms that are most likely to be successful in increasing job growth. In the final part of this analysis our data shows that the relationship between employment and productivity is a complex one.

That jobs are being created and destroyed at the same time, even in years of very high growth, partly reflects the re-allocation of employment from contracting sectors such as textiles to expanding sectors such as financial services. This is not a complete explanation, however, as even within any individual sector we also observe jobs being created and destroyed at all points in time. Therefore, a substantial factor underlying job flows is the reallocation within sectors from under-performing firms to expanding firms.

The contents of the paper are as follows: Section 2 discusses the source and coverage of the data. Section 3 presents calculations of job creation and destruction rates for the whole economy and compares the Irish experience to that of other countries. Section 4 discusses sectoral reallocation as an explanation for the observation of simultaneous job creation and destruction. Section 5 looks at the paths of expanding and contracting firms, presenting estimates of how long-lived newly created jobs are and how likely destroyed jobs are to be reinstated, while Section 6 looks at some of the links between employment growth and productivity and Section 7 concludes.

2. Data

Forfás are the providers of the two data sets used in this paper.[1] The primary results on job gains and losses are calculated using the Forfás Employment Survey. This survey tracks employment levels and has been carried out on an annual basis since 1972, covering agency-supported firms engaged in manufacturing and internationally traded

[1] Forfás is the Irish national policy advisory board for enterprise, trade and technology and operates under the Government Department of Enterprise, Trade and Employment.

services. Each establishment is allocated a unique identifying number that allows researchers to follow individual units over time while preserving the anonymity of the data. The information contained in the survey is limited to numbers of permanent full-time employees, along with some descriptive information on the sector the firm operates in, ownership and location. The primary benefit of this data source is that it has been carried out on a consistent basis for a considerable period of time, allowing us to track the evolution of employment at the establishment level for 34 years.

The second Forfás data set is called the Annual Business Survey of Economic Impact (ABSEI), which again surveys firms at establishment level that are engaged in manufacturing and internationally traded services. Compared to the Employment Survey, ABSEI has a shorter time dimension having been carried out on an annual basis since 1983- the ABSEI is only around in its current form since 2000, before that it was called the Annual Survey of Irish Economy Expenditures, and is currently available to the end of 2005. One shortcoming of the survey is that it is biased towards larger firms, as it only covers firms with 20 or more employees. The main advantage of ABSEI is that it contains a more comprehensive set of firm characteristics (including information on employment, value added, wages and material costs) allowing one to examine the relationship between employment growth, productivity and other firm characteristics.

Using data on manufacturing firms from the Central Statistics Office that covered the same period as this study, shows that the firms in the Employment Survey accounted, on average, for 73 percent of manufacturing jobs in Ireland. Given the nature of activity in international traded services sectors it is more problematic to relate job coverage to the general services sector in Ireland. However, taking the Central Statistics Office broader category of 'Financial and Other Business Services", on average, our data accounts for 26 percent of these jobs.

A related issue is the relationship between the trends in the total number of jobs shown in the data set and aggregate job trends in the Irish economy. To assess this, the correlations between our data series and employment series from the Central Statistics Office

Quarterly National Household Survey were checked. The growth rates for total number of jobs in the Employment Survey have a correlation co-efficient of about 70 percent with net job trends in total employment. In the manufacturing sector data series the correlation co-efficient is broadly similar, while, as expected, given the differences in definition, the correlations between aggregate data for "Financial and Other Business Services" and the number of jobs in our data for international traded services is lower.

3. Employment Flows

The examination of data on gross job flows can be used to obtain additional information on employment dynamics, and give a better indication of the amount of structural change the economy is undergoing. This cannot be determined from aggregate employment and unemployment figures. The same net employment change may reflect very different rates of creation and destruction thereby masking an important element of the flexibility or volatility of the labour market (Konings, 1995). In addition higher simultaneous creation and destruction may imply higher adjustment costs for the economy despite resulting in the same net employment change.

The job flow measures we use are defined following Davis and Haltiwanger, (1999):

(Gross) job creation at time t (C_t) is the employment gain (EMP) summed over all business units which expand or set-up between t-1 and t, i.e. for firm e in sector s which is in the set of expanding or new entrant firms S^+, job creation is given by

$$C_{st} = \sum_{e \in S^+} \Delta EMP_{est}$$

(Gross) job destruction at time t (D_t) is the employment loss summed over all business units that contract or shut down between t-1 and t, i.e. for a firm which is contracting or has exited S^-, job destruction is $D_{st} = \sum_{e \in S^-} \left| \Delta EMP_{est} \right|$

Net employment change is job creation minus job destruction.

(Gross) job reallocation (R_t) is the sum of job creation and destruction,

$$R_{st} = \sum_{e \in S} \left| \Delta EMP_{est} \right| = C_{st} + D_{st}$$

Comparisons of job flows can be made more convenient by converting these measures into rates. To do this, the size Z of a business unit e in sector s at time t is defined by the average of its employment in *t-1* and t i.e. $Z_{est} = {}^{1}/_{2}\,(EMP_{est} + EMP_{es,t-1})$. Summing over all business units (these may be firms or plants depending on the database used) in a sector gives Z_{st}, the size of the sector at time t. The next important concept is the choice of growth rate definition; the job flows literature uses a variant on the ordinary growth rate by defining the growth rate g_{est} as the change in employment between *t-1* and t divided by the average of employment in *t-1* and t (unlike the more traditional definition of a growth rate which would divide by employment in *t-1*). The reason for this adjustment is that it gives a growth rate which is symmetric around zero and which lies within a closed interval [-2, 2] , thereby allowing an integrated analysis of entry and exit. Growth rates may therefore be summarised as $g_{est} = ?EMP_{est} / Z_{est}$ for each business unit e, and as $g_{st} = ?EMP_{st} / Z_{st}$ for each sector s. Sectoral job creation, destruction and reallocation rates are:

$$\textit{Creation rate} = c_{st} = \frac{C_{st}}{Z_{st}} = \sum_{e \in S^{+}} \left(\frac{Z_{est}}{Z_{st}} \right) g_{est}$$

$$\textit{Destruction rate} = d_{st} = \frac{D_{st}}{Z_{st}} = \sum_{e \in S^{-}} \left(\frac{Z_{est}}{Z_{st}} \right) \left| g_{est} \right|$$

$$\textit{Gross Reallocation rate} = r_{st} = \frac{R_{st}}{Z_{st}} = \sum_{e \in S} \left(\frac{Z_{est}}{Z_{st}} \right) \left| g_{est} \right| = c_{st} + d_{st}$$

It should be emphasized that our calculations focus on *job flows* and not on *worker flows.* For a discussion of this distinction see Burda and Wyplotz (1994) or Davis and Haltiwanger (1999). To explain what we mean by this, consider a firm that in one year has 20 employees and in the next year reports 21 employees. Our method regards this as the creation of one job. In practice, this could have involved four individuals leaving the company and five being hired. The contrary is also true and job reallocation may be treated as a lower bound to worker reallocation as it is obviously possible for workers to change jobs or move in and out of the labour market without any actual creation or destruction of jobs taking place.

Table 1 shows the rates of job creation, job destruction and net employment growth for the firms covered by the Forfás Employment Survey from 1973 to 2006. Employment growth is positive whenever job creation is greater than job destruction, and aggregate employment declines when job destruction is higher than job creation.

Table 1: Job Creation and Destruction Rates (%)

	Creation	Destruction	Net change
1972-74	9	5	4
1975-77	9	8	1
1978-80	9	7	2
1981-83	8	11	-3
1984-86	9	11	-2
1987-89	10	9	1
1990-92	9	8	1
1993-95	10	7	3
1996-98	12	6	6
1999-01	12	8	4
2002-04	8	10	-2
2005-06	9	8	2

The first noteworthy finding is that jobs are created and destroyed simultaneously in every year. Averaging over the entire period, we find that one in ten jobs are newly created every year and one in twelve were destroyed. The Celtic Tiger era of strong employment growth can be easily identified as beginning in 1993 and peaking in 2000. Even during this period of overall expansion, where job creation reached rates of 12 to 15 percent of total employment each year, the rate at which jobs were destroyed did not fall below 6 percent. In contrast, even in the economic stagnation of the early 1980s some firms expanded and job creation rates never fell below 7 percent.

Comparing these results to the earlier analysis of Barry *et al.* (1998), we find a number of differences arising from the improved economic performance of the period after their data ended in 1994. They found an average job creation rate of 8.4 percent, which increased to 11 percent over 1994-2006. At the same time the job destruction rate fell from 8.9 to 8 percent. Over the entire period covered in this paper, net employment grew by 1 percent per annum – mainly due to the 3.5 percent annual growth post-1994. In addition to these changes in job creation and destruction rates, we also observe changes in their volatility in the periods before and after 1994. The volatility of job creation (standard deviation) increased from 1.7 in 1974-1994 to 2.0 in 1994-2006, while that of job destruction decreased from 2.1 to 1.8.

To put these figures in context, they are strikingly similar to the US, where previous research by Davis and Haltiwanger (1992) found that manufacturing job creation averaged 9.2 percent and job destruction 11.3 percent. Gomez-Salvador *et al* (2004), using cross-country data on the largest firms in the EU, looked at the evolution of jobs in the 1990s. They showed that net job creation averaged 1.9 percent, arising from average job creation and destruction rates of 5.6 and 3.7 percent, respectively. Given the type of data used, the EU figures are not directly comparable with the results reported in this paper because of their restricted focus on large firms. However, even within that study, Ireland was one of the countries that exhibited large job creation and destruction rates at 8.5 and 3.1 percent respectively, and had the highest net job growth rate at 5.4 percent.

4. Sectoral Evidence

The sectoral composition of Irish employment has changed considerably over the past three decades. To some extent, this is an explanation for the observation of jobs being both created and destroyed at the same time, as certain sectors contract and others grow. Table 2 shows how job creation and destruction rates have varied across sectors and how these combine to generate differing performances in net employment growth.

Table 2: Average Job Creation and Destruction Rates by Sector

1972-2006 (%)

	Creation	Destruction	Net Change
Chemicals	8	5	3
Clothing	8	14	-5
Drink & Tobacco	4	6	-2
Financial Services	21	7	14
Food	7	7	0
Furniture	10	9	0
Internationally Traded Services	19	10	9
Metals & Engineering	11	9	2
Mining & Quarrying	13	9	4
Misc. Manufacturing	11	11	0
Non-Metallic Minerals	6	7	-1
Paper and Printing	6	7	-1
Plastics and Rubber	10	9	1
Textiles	8	12	-4
Wood & Wood Products	10	9	1

In the more traditional manufacturing sectors, such as textiles and clothing, we find the job destruction rate is consistently higher than the job creation rate as these sectors decline over time. Other sectors, such as financial services, have experienced considerable employment growth as the rate at which jobs are created has outstripped that of job destruction. The gradual restructuring of the economy away from lower technology sectors to higher technology manufacturing and services is evident from these calculations.

In addition to these aggregate trends of reallocation of jobs across sectors, it is also apparent that *within each sector* the net change in employment is made up of sizable flows of jobs from contracting to expanding firms. Sectors such as food and furniture,

despite almost zero employment growth, exhibit offsetting job creation and destruction rates of up to 10 percent each year.

Over the period of our sample, job reallocation across sectors accounted for 56 percent of all establishment-level job changes, while re-allocation within sectors accounted for the remaining 44 percent. The 56 percent figure was calculated by dividing the sum of all sectoral-level changes in employment (both positive and negative) by the total number of establishment-level job changes (again both positive and negative). If re-allocation of jobs between sectors were the only factor underlying job flows then this calculation would produce a value of 100 percent.

There is a broad consensus that job destruction serves to increase aggregate productivity by removing or reducing the bottom end of the micro-level productivity distribution, [for a detailed discussion see Caballero and Hammour (1994) and Den Hann *et al* (2000)]. This gives an indication of how job flows within an industry may contribute to productivity improvements within a sector by allowing movements of jobs away from low to high productivity firms. These potential productivity gains are in addition to the gains that are recognised for sectoral job reallocation with jobs moving from declining to expanding sectors.

Table 3 shows the percentage rates of job gains and losses, when the sample is split by nationality of ownership. Splitting the sample by ownership shows that Irish owned firms had a nearly zero net employment change, while UK owned firms had a negative net employment change. On the other hand, US owned firms exhibited the highest percentage gross job creation and net employment change figures. A cross-country comparison by Faggio and Konings (1999) found that foreign-owned firms have higher job creation and excess reallocation rates and typically lower job destruction rates. Walsh and Whelan (2000) link plant growth and performance with trade orientation and show how this can explain a significant proportion of the permanent job reallocation process in Ireland between 1972 and 2000.

Table 3: Job Reallocation Rates by Nationality of Ownership (%)

	Creation	Destruction	Net
Ireland	9	9	0
UK	7	9	-2
EU-15 (ex.UK)	8	7	1
Other Europe	7	7	1
USA	12	7	5
Rest of World	11	10	1

Looking in more detail at the relatively high percentage figures for the rest of the world (ROW), it can be shown that firms whose ownership countries are Canada, Japan and Norway are responsible for these results. It is important to note that this may be due to certain nationalities being concentrated in high job growth sectors, (with over half of these firms in the chemical, financial services or international traded services sectors) and is not attributable to any direct nationality effect.

5. Patterns of Firm-Level Expansion and Contraction

In spite of underlying firm level heterogeneity, there are some systematic differences across sectors and firm characteristics that are worth noting. Our analysis has highlighted the co-existence of job expanding and contracting firms in all sectors and at all points in time, and discussed how relatively small changes in total job growth are made up of much larger inflows and outflows of jobs at the firm level.

A study by Davis et al. (1996) found that excess reallocation rates are declining in capital and energy intensity and are increasing in plant-level product specialisation and industry-level total factor productivity growth. This section considers whether it is possible to identify patterns that can help to distinguish those firms that will tend to grow and create jobs from those that will tend to contract. Four aspects of this question will be looked at:

- Is there a relationship between job creation and the current size of the firm?
- How important is the entry of new firms and the closing down of firms to rates of

job creation and destruction respectively?

- How much volatility is there in the growth of firms? In other words, is there a tendency that today's growing firm will continue to grow in the next period?
- How permanent are a firm's decisions to create or destroy jobs, or are many of these decisions short-lived responses to market fluctuations?

Concerning the first question, the data show a negative relationship between establishment size and the rate at which jobs are created and destroyed. Table 4 shows that smaller units both create and destroy jobs at higher rates than larger ones. On average, over the sample period, establishments in every size group added more jobs than they eliminated, as would be expected given the considerable economic expansion of recent years.

Table 4: Average Job Creation and Destruction Rates by Firm Size (%)

No. Employees	Creation	Destruction	Net	% of Firms	% Employment
1-10	16	14	2	54	6
11-20	14	9	5	15	7
21-30	12	7	5	8	6
31-50	11	6	5	8	9
51-75	11	6	5	5	8
76-100	10	6	4	3	7
101-150	9	5	4	3	10
151-200	9	5	4	1	7
201-250	9	5	4	1	5
251-400	8	4	3	1	11
401-500	7	4	3	0	5
500+	7	4	3	1	18

Very small establishments (with ten employees or fewer) experience by far the greatest

volatility in their employment flows, with new jobs accounting for 16 percent of their employment on average each year and 14 percent of jobs in this group being lost. In contrast, the largest units in the sample (employment over 500) had average job creation rates of 7 percent and job destruction rates of 4 percent. Table 5 presents results that provide further backing for the link observed in the summary statistics between firm size and the rates of job creation and job destruction. The regression equation is specified as:

$$\ln X_i = \alpha + \beta \ln Emp_i + \gamma Sector + \eta Year + \varepsilon_i$$

Where X denotes either the job creation or (absolute value of the) job destruction rate for firm i; *Emp* is the firm employment and *Sector* and *Year* are dummy variables for the 4-digit sector and year. The variables are in logs, therefore the coefficients can be interpreted as elasticities. A significant negative relationship is found both for the creation rate and the destruction rate. Even controlling for sector and time effects, smaller firms experience considerably higher rates of job turnover than larger firms.

Table 5: Job Creation and Destruction Rates and Firm Size

	Ln Creation Rate	Ln Destruction Rate
Ln Employment	-0.25*	-0.40*
	(0.01)	(0.01)
Year & Sector Controls	Yes	Yes
No. Observations	10942	7789
R^2	0.12	0.32

Denotes significance at 1% level. Standard errors in parentheses.

These findings may reflect the fact that small firms are learning about their market and their competitiveness, and are therefore more vulnerable to surprises than larger, more established firms. In this context, it should be pointed out that although small establishments account for a very large proportion of the total population of firms, their

contribution to total employment is much smaller. Firms of fewer than 10 employees make up 54 percent of firms but account for just 6 percent of the total jobs in the dataset we use. On the other hand, firms with over 500 employees are relatively rare in our sample; just 1 percent of all firms are this large but they account for 18 percent of the jobs. Looking at the number of jobs created annually the data shows that, on average, firms with more then 500 employees created 2,400 jobs, while firms with 10 employees or fewer created 950 jobs.

Table 6: Contributions of Entry, Exit and Continuing Firms to Net Employment (%)

	Entrants	Exits	Increasers	Decreasers	Net
1972-74	3	-1	6	-4	4
1975-77	3	-2	6	-6	1
1978-80	2	-2	7	-5	2
1981-83	2	-4	6	-7	-3
1984-86	3	-4	6	-6	-2
1987-89	2	-4	7	-5	1
1990-92	2	-3	7	-5	1
1993-95	2	-2	8	-5	3
1996-98	2	-2	10	-4	6
1999-01	2	-2	10	-6	4
2002-04	2	-3	7	-7	-2
2005-06	1	-2	8	-5	2
1973-2006	2.2	-2.7	7.4	-5.7	1

The second question relates to the contributions of entry and exit of establishments to overall job creation and destruction rates. These calculations are described in Table 6. In each year, establishments are separated into four groups: entrants, exitors, units increasing employment and units decreasing employment. The average job creation rate

over the sample period was 9.6 percent. This was made up of 2.2 percent job creation by newly formed units and the remaining 7.4 percent from existing establishments increasing their employment. The average job destruction rate of 8.4 percent can likewise be decomposed into the contribution of exitors, who had a destruction rate of 2.7 percent, and a job destruction rate of 5.7 percent from continuing but declining units. An alternative way to express this is that just one-fifth of job creation came from new establishments, whereas one-third of job destruction came from firms shutting down. The contribution of entry and exit is surprisingly high given that, on average, in any year just 8 percent of firms are new entrants and 6 percent have exited.

The third question relates to patterns of job growth and decline seen over time. Specifically, we can characterise firms according to their past record of employment changes and then record their subsequent performance. This relates to the question of whether, in practice, firms can be identified as persistent "winners" or persistent "losers". Using time intervals of three years, we divided establishments into four groups: those that grew in one period and declined in the next; those that declined in both periods; those that declined in the first period but grew in the next; and finally, those that grew in both periods. These calculations are described in Table 7.

On average, 31 percent of establishments grew in two consecutive three-year periods and 22 percent continued to contract their employment. This leaves 47 percent that reversed their performance of the previous period. This is made up of 34 percent who had increased employment in one period then reducing it in the next and another 13 percent of firms who switched from declining in the first period to growing in the next. This shows the considerable difficulty involved in predicting which firms will be successful in increasing employment over even relatively short time horizons.

Table 7: Growing, Declining and Performance Switching, Percent of Employment

	grow in t-1 decline in t	*decline in t-1 decline in t*	*decline in t-1 grow in t*	*grow in t-1 grow in t*
	Percentage of Firms in Each Group			
1975-77	30	24	15	31
1978-80	30	21	14	35
1981-83	40	22	9	29
1984-86	35	27	12	26
1987-89	36	23	11	30
1990-92	38	20	12	30
1993-95	32	21	15	32
1996-98	30	17	15	39
1999-01	36	16	11	37
2002-04	41	24	10	26
2005-06	25	24	20	30
Average	34	22	13	31

The relationship between current and past performance appears quiet weak in the decomposition presented in Table 7. However, this does not allow for variation in sector level performance or for differences across firm size categories. As we saw in Tables 4 and 5 above, smaller firms tend to have more volatility in employment, as they learn about market conditions. Table 8 further examines the link between current and past performance but controls for the additional elements of size, sector and time effects. The specification for the regression is:

$$Grow_{it} = \alpha + \beta Grow_{i,t-1} + \kappa SizeGroup_{it} + \gamma Sector + \eta Year + \varepsilon_{it}$$

Where $Grow_{it}$ is a dummy variable taking a value of 1 if the firm expanded in the current period and 0 otherwise. This is regressed on its lagged value $Grow_{i,t-1}$ and a series of dummy variables representing size groups $SizeGroup_{it}$ in addition to sector and year controls.

Table 8: Current and Previous Performance

	Firm Growth Dummy
Lagged Firm Growth Dummy	0.08* (0.01)
11-20 Employees	0.30* (0.02)
21-30 Employees	0.33* (0.02)
31-50 Employees	0.43* (0.02)
51-75 Employees	0.45* (0.02)
76-100 Employees	0.46* (0.02)
101-150 Employees	0.48* (0.02)
151-200 Employees	0.47* (0.02)
201-250 Employees	0.44* (0.02)
251-400 Employees	0.47* (0.02)
401-500 Employees	0.49* (0.02)
500+ Employees	0.49* (0.03)
Year & Sector Controls	Yes
No. Observations	14012
R^2	0.18

Denotes significance at 1% level. Standard errors in parentheses.
The base category is firms with fewer than 10 employees.

We find a positive and significant relationship between current and past performance, even taking into account size and sector. However, neither the coefficient nor the R^2 are particularly high, so the earlier comment on the difficulty of identifying future winners remains valid. The surprisingly large degree of switching from being a growing firm to declining, or from declining to growing, relates to our final question of how persistent are newly created or destroyed jobs. This is a particularly relevant issue for policymakers who will want to support establishments that are creating stable long-term employment.

Because the data used in this paper allows us to track firms over time, we can calculate how many of the jobs created in any one year are still in existence in the following year.

Looking at Table 9, we see that for every 100-jobs created, 81 are still in existence a year later, while 59 still exist after two years. Likewise we can calculate if destroyed jobs are likely to be replaced a period later. For every 100-job reductions observed, 88 remain one year later, and 74 two years later. The higher rate of persistence for job reductions compared to creation suggests that firms tend to reduce employment only if they expect the reduction to be permanent. Comparing these persistence rates to those found by Barry *et al.* (1998), it appears that newly created jobs have become more likely to survive over one and two year horizons – they find a one-year persistence of 65 percent and a two-year rate of 53 compared to our figures of 81 and 59 respectively for the longer time period. We also note an increase in the persistence of job destruction, with the Barry et al. one-year rate of 75 compared to our finding of 88 percent.

Table 9: Average Persistence Rates:
All Firms & by Nationality of Ownership (%)

	1-year	2-year
Job Creation		
All Firms	81	59
Irish Owned	78	55
Foreign Owned	84	64
Job Destruction		
All Firms	88	74
Irish Owned	87	74
Foreign Owned	88	75

Splitting the sample by ownership shows that foreign owned firms tend to retain more created jobs compared to Irish owned firms and the difference in retention rates increases from year one to year two. One potential explanation for this is firm size. In that foreign owned firms entering the Irish market locate here to serve the European market and even though they are typically "Greenfield" operations, given their function they are necessarily larger than the average domestic firm. Job loss rates are broadly similar for

both Irish and foreign firms, with little change in the relative differences between the two groups in year one and year two.

6. Productivity and Employment Changes

The earlier part of this analysis looked at whether firms can be identified as persistent "winners" or persistent "losers" judging the firms on the single dimension of employment size. Up to this point, the analysis has explicitly assumed that job turnover contributes to productivity improvements, either through sectoral reallocation with jobs moving from declining to expanding sectors or by allowing jobs to move from low to high productivity firms in the same sector. This section examines this idea in more detail to identify any patterns of co-movement between productivity and employment that may exist for this sample of firms.

It is worth noting that based on previous research the impact of job creation on productivity is somewhat ambiguous. During a recession greater numbers of low-wage jobs than high-wage jobs are shed and in expansionary periods many more low-wage than high-wage jobs are created. This cycle may either decrease or increase aggregate productivity by either adding to or reducing the bottom end of the micro-level productivity distribution. One potential problem with these models is the assumption that low-wage jobs are always low productivity jobs, thus additional job creation has a negative impact on the micro-level productivity distribution [for a detailed discussion see: Merz, Monika., (1999) and Solon *et al* (1994)].

The first aspect of this issue to be tested relates to identifying patterns of employment and labour productivity growth during the period of this study and the results of these calculations are shown in Table 10. Productivity is defined as value-added per employee. In particular, firms are divided into four groups according to their employment and productivity performance from one year to the next: the first group "successful upsizers" contains those firms that grew both employment and productivity; the second group contains "successful downsizers" these are the firms that reduced employment and grew their productivity; the third group "unsuccessful upsizers" are those firms that increased

employment and experienced productivity declines; the final group contains "unsuccessful downsizers" these are the firms that reduced employment and experienced a decline in their productivity.

Table 10: Employment and Productivity

"Successful Upsizers" Increased Employment Increased Productivity **27% of Firms**	"Successful Downsizers" Decreased Employment Increased Productivity **20% of Firms**
"Unsuccessful Upsizers" Increased Employment Decreased Productivity **34% of Firms**	"Unsuccessful Downsizers" Decreased Employment Decreased Productivity **19% of Firms**

Note that this categorization of firms into quadrants does not give any indication of the size of either employment or productivity changes, only their direction.

On average, 27 percent of establishments in the sample grew both their employment and productivity in each two-year period. Firms can find themselves within "successful upsizers" group for various reasons; one possibility is that through technological innovation they have moved closer to optimal efficiency. Alternatively, employment and productivity can grow if the firm experiences increased demand for its products combined with growing returns for technology.

The group containing "successful downsizers" shows that 20 percent of Irish based establishments increased their productivity at the expense of employment in each two-year period. One explanation for this pattern is that in some firms technological innovation or investment in capital may act as a substitute for labour. Based on this analysis, it does not appear that there is any simple relationship where downsizing is a prerequisite for productivity growth. If this were the case then there should be a

significantly larger number than 1 in 5 enterprises contained in this group.

At 34 percent, the "unsuccessful upsizers" group with increasing employment and falling productivity forms the largest segment of firms in the data. Previous research suggests the behavior of these enterprises is consistent with a negative productivity shock and static product demand. Another possibility is that these firms have changed their employment conditions and are attracting lower (in terms of productivity) quality employees. Alternatively demand may be expanding but new workers take time to train and the productivity fall is temporary.

Approximately 1 in every 5 firms may be classified as "unsuccessful downsizers". The performance of establishments that fall within the "unsuccessful downsizers" group may be explained by falling or static demand for their products combined with increasing returns for large-scale producers. It might also be the case that these firms have not successfully completed (in terms of employee skill composition) their employment adjustment phase, as new employees take time to train.

A study by Bailey et al (1996) looking at co-movement between productivity and employment within US firms reported that 32 percent of firms could be classed in the "successful upsizers" group, another 26 percent of firms within the "successful downsizers" group, while 29 percent of firms were in the "unsuccessful upsizers" group and the remaining 14 percent of firms fell within "unsuccessful downsizers" group.

The final part of our analysis looks at the relationship between employment growth and a range of firm characteristics. In particular, we use the following specification:

$$EmpGrowth_{it} = \alpha + \beta Emp_{it} + \kappa Labprod_{it} + \lambda Wage_{it} + \varphi WageGrowth_{it} + \gamma Sector + \eta Year + \varepsilon_{it}$$

Where *EmpGrowth* is employment growth in the firm between *t-1* and *t, Emp* is the employment level in the firm in period *t*, *Labprod* is labour productivity, measured as value-added per employee, *Wage* is the average wage in the firm and *WageGrowth* is the growth in average wage between *t-1* and *t*. Dummy variables for sector and year are also included. Note that the variables are in levels and the coefficients cannot be interpreted

as elasticities. We then split the sample into two groups for each time period – expanding and contracting firms – and replace the dependent variable with the rate of job creation for expanding firms and the rate of job destruction in contracting firms.

Table 11 shows that for the entire sample labour productivity was positively related to employment growth (higher productivity firms are more likely to create more jobs). This result was confirmed when the sample was split into the two subgroups – those increasing employment and those reducing employment. Productivity growth was positively related to job gains in expanding firms and productivity growth was negatively related to job losses in contracting firms. [2].

Table 11: Employment Growth and Firm Characteristics

	Employment Growth	Rate of Job Creation by Expanding Firms	Rate of Job Loss in Contracting Firms
Employment	-0.17***	-0.12***	-0.03**
	(0.018)	(0.008)	(0.011)
Labour Productivity	0.08***	0.02***	-0.03**
	(0.013)	(0.004)	(0.012)
Average Wages	2.86***	0.94***	0.48**
	(0.233)	(0.097)	(0.189)
Wage Growth	-0.001	0.003**	0.009***
	(0.002)	(0.001)	(0.0008)
Sector & Year	Yes	Yes	Yes
R-sqd	0.02	0.08	0.26

Firm variables are lagged one year. Standard errors are in parentheses.
*** Indicates significance at 1%, ** at 5% and * at 10%.

Average wage levels were positively related to job gains in expanding firms. While in contracting firms, wage levels did influence job losses, the magnitude of this effect was approximately 50 percent lower than for job gains. The relationship between wages and employment has two aspects – although wage bills are a cost to the firm, they can also be interpreted as a proxy for the skill level of the employees, on the assumption that wages reflect the marginal product of labour. Hence, there is no contradiction in finding

[2] By focusing on labour productivity instead of total factor productivity, this analysis cannot fully explain the role of capital deepening or biases in technical change within the firm. An obvious example of this is investment in labour saving capital equipment that increases labour productivity, but which may not be successful in providing similar increases to total factor productivity.

positive relationship between wages and both employment gains and losses. Rather, without information on the individual employees, it is not possible to distinguish between both the positive impact of skill and the negative impact of cost forces. Finally, as expected, a negative relationship was found between firm size and job growth. Larger firms create and destroy jobs at a lower percentage rate compared to smaller firms (of course the absolute numbers of job gains and losses still are higher in large firms).

Looking at the entire sample no statistically significant relationship was found between wage growth and employment growth. Dividing the sample into increasing and decreasing employment groups, a positive relationship was found between wage growth and job gains in expanding firms. In contracting firms, wage growth had a considerable influence on job losses, with a magnitude 3 times higher than for job gains.

7. Conclusions

Changes in the net number of jobs arise from large numbers of firms both increasing and decreasing employment simultaneously at all points in time. Jobs are created and lost even in years of very high employment growth. To a degree, this reflects the re-allocation of jobs from declining sectors to expanding sectors, but this is not a comprehensive explanation.

These calculations also show that performance varies widely across firms. Many firm-level factors beyond the control of government have a profound influence on job flows. This analysis demonstrates the considerable difficulty involved in predicting which firms will be successful in increasing employment. In general, policies aimed at shoring up employment artificially in non-viable sectors or firms are probably not an efficient use of public resources, because the process of re-allocation of employment, from contracting sectors to expanding and from under-performing firms to successful ones, is an important facilitator of productivity growth.

In general we find that labour productivity was positively related to employment growth (higher productivity firms are more likely to create more jobs). This fits with the

predictions of economic theory that job turnover facilitates productivity improvements by allowing movement from low to high productivity firms, both within and between sectors.

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