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Job Creation and destruction by plant size in Taiwan

Liu De-Chih[1]

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Centre of Full Employment and Equity
The University of Newcastle, Callaghan NSW 2308, Australia
Home Page: http://e1.newcastle.edu.au/coffee
Email: coffee@newcastle.edu.au

1. Introduction

Since David L. Birch's (1979) pioneering paper was published, there has been a widespread perception that small businesses are the main engine of job creation. This conventional wisdom remained largely unchallenged until the work of Davis, Haltiwanger and Schuh (1993; 1996a; 1996b) demonstrated results to the contrary. Stimulated by Davis's *et al.* (1993; 1996a; 1996b) influence, there is now an abundance of literature, which has reexamined the small business job creation hypothesis. However, the empirical results are inconsistent. Baldwin and Picot (1995) for Canada, Wagner (1995) for Germany, Broersma and Gautier (1997) for Holland, Genda (1998) for Japan, Hohti (2000) for Finland used annual data to examine job flows by size class. In general they found that small firms are the main job creators. Conversely, Borland and Home (1994) for Australia, Konings (1995) for U.K., and Tsou *et al.* (2002) for Taiwan produce results which indicate that large firms or plants have higher job creation shares. In addition, recent research by Juniper *et al.*, (2004) showed that large firms had higher rates of job creation, and lower rates of job destruction for 1997-1998 in Australia.

While the debate has stalled somewhat, there are still several unresolved issues that require further analysis. First, most of the research literature focuses on the manufacturing sector and attempts to generalise from that experience (Davis *et al.*, 1993, 1996a, 1996b; Borland and Home, 1994; Baldwin and Picot, 1995; Broersma and Gautier, 1997; Tsou *et al.*, 2002). The characteristics of job creation by plant size outside the manufacturing are still largely unknown. Second, there is a major unresolved issue surrounding the appropriate method for calculating job flows. The results have been shown to be highly sensitive to the method used. Therefore, the purpose of this paper is to further explore these issues.

The paper is organised as follows. Section 2 presents the purpose of this study. Section 3 describes the data sources and the different methods of measuring job flows. Section 4 describes the basic pattern of job creation and destruction (JC&D) by plant size in three sectors (manufacturing, service, and construction). Section 5 examines the number of inter-class plants. Section 6 discusses the impact of inter-class plants on job creation and destruction. The following section will synthesis the elements of this paper and outline further issues that need to be explored.

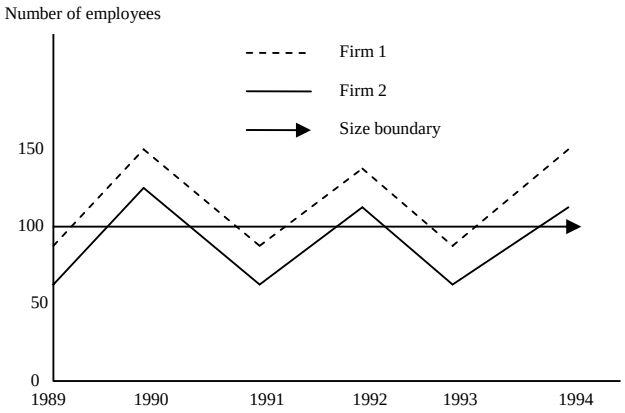
2. Purpose

Since most studies have been based on the Davis's *et al.* (1993; 1996a; 1996b) criticism of the earlier literature, it is necessary to begin our study by focusing on the major elements of their critique. Davis *et al.* (1993; 1996a; 1996b) argued that previous work, which found that small business create the most jobs suffered from three major methodological flaws. The first two methodological fallacies are easy to discard because the bias they imparted into the results not systematically favoured small businesses (Davidsson *et al.*, 1998). The most interesting and debated issue involves the third flaw – the so-called regression fallacy. For example, Story (1995: 5) say "It is unquestionably these results (concerning the "regression fallacy"), which have attracted attention to the paper by Davis *et al.*"

The regression fallacy otherwise referred to as the 'regression-to-the-mean bias' may arise because firms or plants temporarily grow/contract across size boundaries. Under certain circumstance, using what is known as a 'base-size' measure of job dynamics,

these movements can bias the estimates in favour of the small business.[2] Davidson *et al.* (1998) uses Figure 1 to explain the regression fallacy. Using a definition of small business as firms with less than 100 employees, we would classify firms 1 and 2 as being 'small' in 1989. In 1990, using this benchmark both firms become 'large firms'. By employing the base-year measurement for job creation (destruction), the job creation of these growing firms will be attributed to the small business. In 1991, both firms fall back into the small size category. Consequently, the job destruction generated by both firms will be ascribed to the large business category. Clearly, this way of accounting for the job gains and losses is less than satisfactory.

Figure 1. The inter-class movement



Source: Davidsson *et al.* (1998).

In order to avoid the regression bias, Davis *et al.* (1993; 1996a; 1996b) proposed two measures of JC&D: (a) average size; and (b) current size. They prefer the average size measure, which calculated as the average employment across all periods. However, the average size measure has not gained a foothold in the literature because it is only useful if all size changes are random (Baldwin and Picot, 1995; Kirchhoff and Greene, 1995; Carree and Klomp, 1996; OECD, 1996; Davidsson et *al.*, 1998). The current size measure is defined as the simple average of size at t-1 and the size at t. Since the effects of using current size measure are more precisely tractable, this measure seems reasonable to eliminate the regression bias (Davidsson *et al.*, 1998).

Table 1 is taken from the studies Davis et al. (1993; 1996a; 1996b) for the US manufacturing sector and summarises the sensitivity of the JC&D estimates to the different measurement approaches form 1973 through 1988. Note that if the base-year measure is used the smallest size category (0 to 19) has highest net job creation rate (10.3 per cent). However, the other measures provide a different outcome. Using the current-year measure (see above), the smallest size firms (0 to 19) have the lowest net job creation rate (-4.5 per cent) and the largest size firms (more than 500) have the highest net job creation rate (-0.2 per cent). It was on this evidence that Davis *et al.* (1993; 1996a; 1996b) concluded that the base-year measure generated biased results - the regression fallacy. Davis *et al.* (1993: 17; 1996a: 307; 1996b: 70) say "Evidently, the regression fallacy illustrated in box 4.1 operates with powerful effect in the LRD data for the U.S. manufacturing sector."

Their results however were highly criticised by other researchers in the field. Some were unconvinced by what they claimed was 'indirect' evidence (see Kirchhoff and Greene; 1998: 162) while others were disappointed with the scholarship of Davis *et al.* (see Davidsson *et al*.; 1998: 98). Interestingly, Davidsson *et al.* (1998) showed that the effect of regression bias was very small based on the Swedish database. This begs the question as to why the base-year and current-year measures generate such different outcomes. Exploring this issue is the main objective of this paper.

Table 1 Net job creation rates in U.S. manufacturing 1973-1988(%)

	Net JC Base-year	Emp Share Base-year	Net JC Current-year	Emp Share Current-year	Net JC Average-year	Emp Share Average-year
(1) 0 to 19	10.3	5.2	-4.5	5.2	-1.3	4.4
(2) 20 to 49	0.6	8.5	-2.1	8.6	-1.1	8.2
(3) 50 to 99	-0.7	10.4	-1.3	10.5	-0.9	10.1
(4) 100 to 249	-1.7	18.6	-1.1	18.5	-1.4	18.5
(5) 250 to 499	-2.5	16.0	-1.0	16.0	-1.3	16.6
(6) 500 to 999	-2.7	13.5	-0.6	13.5	-1.0	13.8
(7) 1000 to 2499	-2.6	12.3	-1.0	12.3	-1.6	12.5
(8) 2500 to 4999	-2.5	7.0	-1.3	7.0	-1.7	7.2
(9) 5000 to more	-2.4	8.5	-0.2	8.4	-0.6	8.8

Source: Davis *et al.* (1993: 37; 1996a: 306; 1996b: 69). Note: Net JC is the Net job creation rate as defined in Section 3 of the text. Emp share refers to employment shares which are computed as the means of monthly values for the period 1987 to 2001.

The hypothesis advanced in this paper is that the inter-class movements by plants between different measures are the main reason why the base-year and current-year measures produce such different results. Tables 2 and 3 show that the sensitivity of the way we classify plant size to the different measures employed and their immediate history of job creation/destruction. One plant, for example, with 15 employees creates 12 jobs in next month. Using the base-month measure and size categories in Table 2, the 12 jobs would be counted against a Group 1 plant (between 0 and 19 employees). However, using the current-month measure means that we would attribute the 12 jobs to a Group 2 plant (between 20 and 49 employees).

From Table 3 we can see that a plant with 120 employees in January destroys 42 jobs in February. Using the base-month measure and size categories in Table 3, we would attribute the 42 jobs destroyed to a Group 4 plant (between 100 and 249 employees), whereas using the current-month measure, the same job destruction would be allocated to a Group 3 plant (50 to 99 employees).

Table 2 Plant Classification under Job Creation

	Plant 1	Base-month	Current-month
Jan employment	15		
Feb employment	27	15 (Group1)	21 (Group2)
Job creation	12		

Table 3 Plant Classification under Job Destruction

	Plant 1	Base-month	Current-month
Jan employment	120		
Feb employment	78	120 (Group4)	99 (Group3)
Job destruction	42		

To explore this issue further, three main issues need to be addressed. First, the average rates and shares of job creation and destruction by plant size in three sectors (manufacturing, service, and construction) need examining. The average rates and shares of job creation and destruction are compared using the two measures (Base-month and Current-month). Second, the number of inter-class plants will be investigated. Finally, we will examine the impact of the inter-class plants on the job creation and destruction between base-month and current-month measures.

3. Data and Measurement

The data are drawn from the Survey on Earnings of Employees (SEE) from 1987 to 2001 conducted by the Statistical Bureau of Taiwan. The data are collected monthly at the establishment level. The monthly frequency provides significant advantages over lower frequency data. For example, say a plant dismisses 100 employees in January 1998 and hires 70 employees in July 1998. Using annual data would show a net job loss of 30 employees in 1998, whereas monthly data will provide a more complete rendering of the relevant job flows. A noted weakness of plant data is that it may include employees who move across plants, which means the rates of job creation and destruction may be overestimated. However, Hamermesh *et al.* (1996) suggests that inter-plant transfers are a minute fraction of worker flows, which would suggest that this weakness will not unduly influence the principal findings in this study.

In this paper, the concept of measure is similar to that proposed by Davis *et al.* (1993; 1996a; 1996b). The net employment change in establishment i from t-1 to period t.

(1) $\Delta E_i = E_{it} - E_{i,t-1}$

Gross job creation is the sum of the positive net changes across establishments. Gross job destruction is the sum of the absolute values of the negative net changes.

(2) $JC = \sum_i \Delta E_i^+$

(3) $JD = \sum_i \left| \Delta E_i^- \right|$

The net employment change is the difference between gross job creation and destruction:

(4) $NET = JC - JD$

The sum of job creation and destruction is job reallocation or job turnover, which describes the reshuffling of employment opportunities across establishments.

(5) $JR = JC + JD$

The difference between job reallocation and net employment change is excess job reallocation (ER), which describes simultaneous job creation and destruction

(6) $$ER = JR - |NET|$$

There are two different ways express job creation and destruction figures as rates. The current-month measure divides by the simple average of employment at t-1 and the size at t, whereas the base-month measure divides by the employment at t-1. Since the SSE is a monthly survey, it provides information on plant job reallocation each month. As a consequence, the different results derived from the two measures arise because of the behaviour of the inter-class plants. One limitation of this study is that it is unable to examine the contribution of entry and exit of plants to job flows, because the data of new plants or exiting plants is not available.

4. Job flows by plant size in three broad sectors

This section describes the job flows by establishment size in the manufacturing, service and construction sectors in Taiwan. Table 4, 5 and 6 show the job flow rates and shares calculated using the base-month and current-month measures in the manufacturing, service, and construction sectors, respectively.

4.1 Job flows by establishment size in manufacturing sector

Table 4 shows the job creation and destruction rates by base-month and current-month measures in the manufacturing sector from 1987 to 2001. Interestingly, the results are similar to Davis's *et al.* (1993, 1996a, 1996b). In Panel A, the smallest size category has highest net job creation rate (7.53 per cent), but it has negative net job creation rate (-0.38 per cent) in Panel B. Moreover, the second smallest size category has the lowest net job creation rate (-0.78 per cent) in Panel B, but it also has a positive net job creation rate (0.26 per cent) in Panel A. Thus, the extent of interclass plants seems to operate in the SSE database.

As presented in Table 4, job creation rates have a negative relationship with plant size despite the measure being used. In Panel B, the job creation rate averages 3.7 per cent of employment per month for plants with fewer than 5 employees and 0.96 per cent for plants with more than 500 employees. Hence, small businesses create new job at a much higher gross rate than the large businesses. There is a similar pattern in job destruction rate, except for the smallest size category in pattern A. In Panel B, the job destruction rate averages 4.08 per cent of employment per month with fewer 5 employees and 0.97 per cent for plants with more than 500 employees. Thus, small businesses also destroy job at a much higher gross rate than the large businesses.

Although small businesses have higher job creation and destruction rates, large businesses dominate the job creation and destruction in both Panel A and Panel B. In Panel B, the plants with more than 100 employees have 83 per cent of job creation share and 80 per cent of job destruction share. This is not surprising because the large businesses with more than 100 employees account for 88 per cent of employment over the 1987-2001 period. However, Table 4 also shows that the job creation and destruction shares of small businesses are much more than their share of employment base. In Panel B, the small businesses contribute 17 per cent of job creation share and 20 per cent of job destruction share although they only have 12 per cent employment share.

Table 4 Job flow rates per month (average 1987-2001, %) by plant size in manufacturing sector

Plant size	NET	JC	JD	JR	JC share	JD share	Emp share
A. Base-month measure							
<5	7.53	9.86	2.33	12.19	0.44	0.08	0.06
5 to 19	0.26	2.68	2.42	5.10	2.07	1.61	0.96
20 to 49	-0.12	2.21	2.33	4.54	6.31	5.81	3.49
50 to 99	-0.31	1.73	2.03	3.76	10.34	10.58	7.24
100 to 199	-0.28	1.52	1.80	3.32	16.83	17.41	13.15
200 to 499	-0.27	1.24	1.51	2.75	27.19	28.98	25.96
>500	-0.09	0.93	1.01	1.94	36.81	35.54	49.14
B. Current-month measure							
<5	-0.38	3.70	4.08	7.77	0.16	0.11	0.06
5 to 19	-0.78	2.19	2.98	5.17	1.69	1.96	0.95
20 to 49	-0.63	1.98	2.60	4.58	5.66	6.45	3.48
50 to 99	-0.48	1.66	2.14	3.80	9.96	11.16	7.25
100 to 199	-0.38	1.47	1.85	3.32	16.18	17.91	13.15
200 to 499	-0.23	1.27	1.49	2.76	27.83	28.61	25.97
>500	-0.01	0.96	0.97	1.93	38.52	33.80	49.14

(a) NET is the net job creation rate, which is job creation rate minus job destruction rate. (b) JC is the job creation rate. (c) JD is the job destruction rate. (d) JR is the job reallocation rate, which is sum by job creation rate and destruction rate. (e) JC share is the job creation share. (f) JD share is the job destruction share. Table entries for the job creation and destruction rates, job creation and destruction shares and the employment shares are means of monthly values for the period 1987 to 2001.

Tsou *et al.* (2002) used annual employment data and their gross job creation rates were five to seven times larger than monthly data in Table 4 and their job destruction rates also four to six times larger than monthly data. This is plausible since the annual data account for the overall change over the year.

4.2 Job flows by establishment size in service sector

Table 5 shows the job creation and destruction rates associate with base-month and current-month measure in the service sector from 1987 to 2001. Similar to the finding in manufacturing sector, the inter-class plants also operate in the service sector. In Panel A, the smallest size category has highest net job creation rate (3.79 per cent), but it has negative net job creation rate (-0.12 per cent) in Panel B. Moreover, the two largest size categories have the highest net job creation rate (0.18 per cent) in Panel B, but the net job creation rate of largest size category is 0.16 per cent in Panel A.

In Table 5, the small size category has large job creation rates in both Panel A and Panel B. In Panel B, the job creation rate averages 1.42 per cent of employment per month for plants with fewer than 5 employees and 0.57 per cent for plants with more than 500 employees. Turning to the fourth column, the small size category also has higher job destruction rate than large size category. In Panel B, the job destruction rate averages 1.54 per cent of employment per month with fewer 5 employees and

0.39 per cent for plants with more than 500 employees. Thus, small businesses create and destroy job at a much higher gross rate than large businesses.

Although small businesses have higher job creation and destruction rates large businesses still play the dominant role in job creation and destruction in both base-month and current-month measures. In Panel B, the plants with more than 100 employees have 79 per cent of job creation and 73 per cent of job destruction. This finding is also acceptable since large businesses with more than 100 employees account for 88 per cent of employment over the 1987-2001 period. However, the data also shows that small business "over" contributed the job creation and destruction shares, which is especially disturbing when considering that small businesses only have 12 per cent employment share, while they contribute to 21 per cent of job creation and 27 per cent of job destruction.

Table 5 Job flow rates per month (average 1987-2001, %) by plant size in service sector

Plant size	NET	JC	JD	JR	JC share	JD share	Emp share
A. Base-month measure							
<5	3.79	4.92	1.14	6.06	1.62	0.52	0.30
5 to 19	0.09	1.63	1.54	3.16	4.18	4.80	1.98
20 to 49	-0.04	1.35	1.39	2.75	8.08	10.02	4.61
50 to 99	-0.09	1.21	1.30	2.52	8.19	10.68	5.15
100 to 199	0.01	1.17	1.16	2.33	9.17	11.00	6.00
200 to 499	0.18	1.09	0.91	2.00	15.90	16.06	11.07
>500	0.16	0.56	0.39	0.95	52.86	46.91	70.89
B. Current-month measure							
<5	-0.12	1.42	1.54	2.95	0.49	0.66	0.29
5 to 19	-0.30	1.48	1.77	3.25	3.77	5.51	1.97
20 to 49	-0.13	1.32	1.45	2.77	7.84	10.42	4.60
50 to 99	-0.03	1.25	1.29	2.54	8.48	10.57	5.15
100 to 199	0.06	1.19	1.13	2.32	9.35	10.73	5.99
200 to 499	0.18	1.09	0.91	2.01	15.96	16.13	11.07
>500	0.18	0.57	0.39	0.96	54.12	45.97	70.93

4.3 Job flows by establishment size in construction sector

Most previous studies did not consider the behaviour of job creation and destruction in construction sector. Thus, in this section we examine the job flows of plants in construction sector. The findings in construction are consistent with manufacturing and service sectors. The Inter-class plants achieved different results in base-month and current-month measures. Small businesses also create and destroy new jobs at a much higher gross rate than large businesses.

Moreover, in contrast to the manufacturing and service sectors, small businesses have higher job creation and destruction shares than large businesses in the construction sector. In Table 6, the plants with less than 100 employees have 57 per cent of job

creation share and 58 per cent job destruction share as calculated by current-month measure although they only have 41 per cent employment share. Importantly, the evidence in the construction sector also supports the finding that small business is disproportionately responsible for job creation and destruction relative to their employment share.

Table 6 Job flow rates per month (average 1987-2001, %) by plant size in construction sector

Plant size	NET	JC	JD	JR	JC share	JD share	Emp share
A. Base-month measure							
<5	7.93	10.06	2.13	12.19	4.86	1.00	1.24
5 to 19	1.04	4.28	3.24	7.53	16.73	11.59	9.29
20 to 49	-0.02	3.35	3.37	6.72	23.09	20.81	15.76
50 to 99	-0.43	2.87	3.29	6.16	19.23	19.56	14.66
100 to 199	-0.45	2.74	3.19	5.93	15.41	16.78	12.68
200 to 499	-1.06	1.81	2.97	4.89	10.70	15.21	13.06
>500	-0.44	0.70	1.14	1.84	9.99	15.06	33.32
B. Current-month measure							
<5	-0.21	3.67	3.84	7.55	1.77	1.71	1.21
5 to 19	-0.53	3.35	3.88	7.23	13.05	13.83	9.27
20 to 49	-0.42	3.17	3.59	6.77	21.73	23.30	15.76
50 to 99	-0.14	3.06	3.20	6.26	20.31	19.30	14.71
100 to 199	-0.12	3.12	3.24	6.36	18.20	16.90	12.69
200 to 499	0.22	2.67	2.46	5.13	14.63	12.20	13.14
>500	-0.32	0.72	1.04	1.76	10.31	13.77	33.22

5. The inter-class plants

Davis's *et al.* (1993, 1996a, 1996b) noted that the regression fallacy might cause a misunderstanding of job creation and destruction by establishment size. This section will therefore directly investigate the number of inter-class plants which cause the difference between base-month and current-month measures. The inter-class plants due to the different classification of two measures and their impact on the job creation and destruction were calculated using a program written in Visual Basic.

Table 7 shows the average plants moving across size categories calculated by different measures in manufacturing, service and construction sectors from 1987 to 2001. The second column describes the plants distribution calculated by base-month measure in manufacturing, service, and construction sectors. The small plants with more than 100 employees have 43 per cent of the sample in the manufacturing sector but 18 per cent of the sample in the service sector. This indicates that small businesses are over-crowded in the service sector. In the construction sector, plants with less than 100 employees have 92 per cent of the sample, which suggests why small businesses have created and destroyed the most jobs in Table 7. Interestingly, large businesses cover only 8 per cent of the sample, but they have 43 per cent of job creation and 42

per cent job destruction shares. This means large businesses also play a dominant role in job creation and destruction.

Table 7 Average number of inter-class plants between base-month and current-month measures (1987-2001)

curren t[b] base[a]	Sample[c]	(1) <5	(2) 5 to 19	(3) 20 to 49	(4) 50 to 99	(5) 100 to 199	(6) 200 to 499	(7) >500
Manufacturing								
(1) <5	136	-	4.29	0.06	0.02	0	0	0
(2) 5 to 19	567	0.41	-	10.02	0.06	0.02	0	0
(3) 20 to 49	778	0	3.67	-	11.75	0.06	0.01	0
(4) 50 to 99	749	0	0.01	7.17	-	9.76	0.01	0
(5) 100 to 199	703	0	0	0	7.58	-	7.11	0
(6) 200 to 499	645	0	0	0	0	6.51	-	2.61
(7) >500	304	0	0	0	0	0	2.74	-
Service								
(1) <5	523	-	6.38	0.12	0.06	0	0	0
(2) 5 to 19	903	0.49	-	7.72	0.02	0	0	0
(3) 20 to 49	739	0	2.52	-	6.13	0.02	0	0
(4) 50 to 99	398	0	0	2.96	-	2.81	0.01	0
(5) 100 to 199	228	0	0	0	1.77	-	1.59	0
(6) 200 to 499	188	0	0	0	0	0.92	-	1.82
(7) >500	166	0	0	0	0	0	0.48	-
Construction								
(1) <5	169	-	5.73	0.05	0.01	0	0	0
(2) 5 to 19	355	0.95	-	5.71	0.06	0.02	0	0
(3) 20 to 49	220	0	2.86	-	3.38	0.03	0	0
(4) 50 to 99	96	0	0	2.33	-	1.45	0.01	0
(5) 100 to 199	43	0	0	0	1.24	-	0.56	0
(6) 200 to 499	20	0	0	0	0	0.57	-	0.05
(7) >500	7	0	0	0	0	0	0.12	-

(a) Base means that the size category were classifying by base-month measure. (b) Current means that the size category of were classifying by current-month measure. (c) The second column means average monthly sample distribution using the base-month measure.

The principal information revealed by the Table 7 is that the number of inter-class plants between base-month and current-month measures is small. For example, for the manufacturing sector, on average, 12 plants crossed size boundary from size category 3 (20 to 49 employees) to size category 4 (50 to 99 employees) due to the classification of current-month measure. In addition, in the manufacturing sector, an average of 7 plants in the size category 6 (200 to 499 employees) were classifying in

size category 5 used the current-month measure. This suggests that the majority of plants remain in one size category through time

6. The impact of inter-class plants on job creation and destruction

The purpose of this section is to examine the effect on the calculated rates of job creation and destruction of plants moving across boundary categories. We calculate these rates using the current-month measure. Although the Section 5 has shown that only a few plants move across size boundaries it was also revealed that the movement of inter-class plants can explain the different results between the base-month and current-month measures.

Table 8 describes the average job creation and destruction that is attributable purely to plants moving across size categories in manufacturing, service and construction sectors. The second and third columns respond to the findings in section 4, which illustrated that large plants play a dominant role in job creation and destruction in manufacturing and service sectors. In the manufacturing sector, for example, the large plants average created 7618 jobs and destroyed 8889 jobs per month but the small businesses average created 1807 jobs and destroyed 1968 jobs per month.

The fourth and fifth columns in Table 8 shows the number of job creation and destruction due to plants moving across boundary categories calculated by current-month measure. In manufacturing, average 26 jobs creation that in the smallest size category (with less than 5 employees) are classifying in the second smallest size category (5 to 19 employees) using current-month measure. On the other hand, in manufacturing sector average 186 jobs destruction that in the largest size category (with more than 500 employees) are due to the inter-class plants.

The sixth column in Table 8 shows the percentage impact on job creation rates of plants growing across boundary categories. In manufacturing, around 62 per cent of job creation in the smallest size category (with less than 5 employees) will be attributed to size category 2 (5 to 19 employees) in the current-month measure. These impacts explain why the net job creation rates are different between Panel A and Panel B in Table 8.

The seventh column in Table 8 shows the percentage impact on job destruction of plants declining across boundary category due to the classification of current-month measure. In the manufacturing sector, around 5 per cent of job destruction in the largest size category 7 (more than 500 employees) will be counted in size category 6 (200 to 499 employees) using the current-month measure.

By way of conclusion the data therefore shows that the impact of inter-class plants is more significant on job creation calculations than it is for job destruction estimates.

Table 8 Average monthly total job creation and destruction per class due to inter-class plants (1987-2001)

	JC(A)[a]	JD(B)[b]	JC by growing plants(C)[c]	JD by declining plants (D)[d]	C/A(%)[e]	D/B(%)[f]
A. Manufacturing sector						
(1) <5	42	9	26	0	61.90	0
(2) 5 to 19	195	177	57	4	27.23	2.26
(3) 20 to 49	595	632	113	35	18.99	5.54
(4) 50 to 99	975	1150	145	104	14.87	9.04
(5) 100 to 199	1586	1891	215	163	13.56	8.62
(6) 200 to 499	2563	3143	162	220	6.32	7.00
(7) >500	3469	3855	0	186	0	4.82
B. Service sector						
(1) <5	68	18	47	0	69.12	0
(2) 5 to 19	175	165	39	2	22.29	1.21
(3) 20 to 49	338	343	52	23	15.38	6.71
(4) 50 to 99	342	365	43	38	12.57	10.41
(5) 100 to 199	383	378	42	38	10.97	10.05
(6) 200 to 499	664	549	53	29	7.98	5.28
(7) >500	2209	1604	0	32	0	2.00
C. Construction sector						
(1) <5	51	12	32	0	62.75	0
(2) 5 to 19	175	133	67	5	38.29	3.76
(3) 20 to 49	241	237	73	28	30.29	11.81
(4) 50 to 99	201	223	61	47	30.35	21.08
(5) 100 to 199	161	191	40	46	24.84	24.08
(6) 200 to 499	112	173	3	49	2.68	28.32
(7) >500	104	172	0	15	0	8.72

(a) JC is the average number of job creation calculated by base-month measure. (b) JD is the average number of job destruction as calculated by base-month measure. (c) The fourth column is the average number of jobs created by these plants moving across boundary category calculated by the current-month measure. (d) The fifth column is the average number of jobs destroyed by these plants moving across boundary category calculated by the current-month measure. (f) The sixth column describes how many percentage of the job creation due to the inter-class plants. The fifth column describes how many percentage of the job destruction due to the inter-class plants. The number of job creation and destruction and the extent due to inter-class plants are means of monthly values for the period 1987 to 2001.

7. Conclusion

There are several significant outcomes of this research. First, large businesses dominate job creation and destruction in the manufacturing and service sectors irrespective of the measures used. Using current-month measure, large businesses have 83 per cent job creation share and 80 per cent job destruction share in

manufacturing sector. Further, 79 per cent of job creation and 73 per cent of job destruction is due to large businesses in the service sector. Large businesses also play a dominant role in the construction sector. Although they only represent 8 per cent of the sample of plants, they have 43 per cent of job creation and 42 per cent destruction shares.

Second, the study has found that small business is disproportionately responsible for job creation and destruction relative to their employment share in the manufacturing, service, and construction sectors. Using the current-month measure, the small businesses only have 12 per cent of the employment share in the manufacturing sector but they have 17 per cent job creation share and 20 per cent job destruction share. In the service sector, 21 per cent of the job creation share and 27 of the per cent job destruction share are due to small businesses although they only have 12 per cent employment share. Similarly, small businesses contribute 57 per cent job creation share and 58 per cent job destruction share even though they only have 41 per cent employment share in the construction sector.

Third, the study has found that the number of inter-class plants between base-month and current-month measures is small. In the manufacturing sector, on average around 4 plants in the smallest size category are classifying in the second smallest size category according to the current-month measure. An average of 3 plants in the largest category will be classified into a smaller size category using the current-month measure.

Finally, the inter-class movements do explain the different results derived using the current-month measure and base-month measure. Around 62 per cent to 69 per cent of the job creation share in the smallest category using the base-month measure will be attributed to the second smallest category if we use the current-month measure. Moreover, approximately 2 per cent to 9 per cent of the job destruction shares in the largest size category using the base-month measure will be attributed to the second largest category if we use the current-month measure.

References

Baldwin J. and Picot G. (1995) 'Employment Generation by Small Producers in the Canadian Manufacturing Sector', *Small Business Economics* 7, 317-331.

Birch, D.L. (1979) 'The Job Generation Process', Unpublished report prepared by the Massachusetts Institute of Technology Program on the Neighbourhood and Regional Change for the Economic Development Administration, U.S. Department of Commerce, Washington, D.C.

Broersma L. and Gautier P.A. (1997) 'Job Creation and Job Destruction by Small Firms: An Empirical Investigation for the Dutch Manufacturing Sector', *Small Business Economics* 9, 211-24

Borland, J. and Home, R. (1994) 'Establishment-level Employment in Manufacturing Industry: Is Small Really Beautiful? Australian Bulletin of Labour, 20(2), 110-128.

Carree, M. and Klomp, L. (1996) 'Small Business and Job Creation: A Comment', *Small Business Economics* 8, 317-22

Davidson, P., Lindmark, L. and Olofsson, C. (1998) 'The extent of Overestimation of Small Firm Job Creation- An Empirical Examination of the regression Bias', *Small Business Economics* 11, 87-100.

Davis, S.J., Haltiwanger, J. and Schuh, S. (1993) 'Small Business and Job Creation: Dissecting the Myth and Reassessing the Facts', Working Paper No. 4492, Cambridge, MA: National Burea of Economic Research.

Davis, S.J., Haltiwanger, J. and Schuh, S. (1996a) 'Small Business and Job Creation: Dissecting the Myth and Reassessing the Facts', *Small Business Economics* 8, 297-315.

Davis, S.J., and Haltiwanger, J. and Schuh, S. (1996b) *Job Creation and Destruction*, MIT Press, Cambridge, Massachusetts.

Genda Y. (1998) 'Job Creation and Destruction in Japan, 1991-1995' *Journal of the Japanese and International Economies* 12, 1-23.

Hamermesh, D.S., Hassink, W.H.J. and van Ours, J.C. (1996) 'Job Turnover and Labour Turnover: A Taxonomy of Employment Dynamics', *Annales d'Economie et Statistque.*

Hohti S. (2000) 'Job Flows and Job Quality by Establishment Size in the Finnish Manufacturing Sector 1980–94' *Small Business Economics* 15, 265-281.

Juniper, J., Mitchell, W.F. and Myers, J. (2004) 'Small business employment dynamics in Australia', The Full Employment Imperative, Proceedings of the 6th Path to Full Employment Conference/11th National Conference on Unemployment, University of Newcastle, December.

Kirchhoff B. and Greene P. (1995) 'Response to the Renewed Attacks on the Small Business Job Creation Hypothesis', Paper presented at the Babson College Entrepreneurship Research Conference, London, April 1995.

Kirchhoff B. and Greene P., 1998, 'Understanding the Theoretical and Empirical Content of Critiques of U.S. Job Creation Research' *Small Business Economics* 10, 153-169.

Konings J. (1995) 'Gross Job Flows and the Evolution of Size in U.K. Establishment', *Small Business Economics* 7, 213-220.

Story, D. (1995) 'Job Creation in SMEs' (mimeo), University of Warwick, U.K.

OECD, (1996), SMEs: Employment, Innovation and Growth- the Washington Workship, Paris: OCED Publication Service.

Tsou M-W, Liu J-T, and Hammitt J. K. (2002) 'Workers Turnover and Job reallocation in Taiwanese manufacturing' *Applied Economics* 34, 401-411.

Wagner, J. (1995) 'Firm Size and Job Creation in Germany', *Small Business Economics* 7, 469-474.

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[2] The definition of base-size measure is to measure each firm's employment change and credit that to beginning size class (Birch, 1979).