**Job Turnover and Total Factor Productivity Growth:**

**Micro evidence from Taiwan (China)**

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Recent research has seen a renewed interest in the roles of productivity growth and the international market in explaining a country's economic performance. The crisis and subsequent slowdown in economic performance in the past year in several countries in East Asia has resulted in a flurry of research into the sources of the crisis. In particular, attention has shifted from the very large growth in the domestic and international demand for the output generated by these countries to an exploration of the sources of the growth of supply which, up to now, have largely been taken for granted. More specifically, researchers with access to large micro-level data sets are now able to make the link to micro features of the economy which influence whether and to what extent the economy is able to respond to exogenous domestic and global shocks.

A crucial issue underpinning economic performance is how well a country allocates its resources in response to long-term changes in demand patterns and technology. This productivity enhancing process of resource reallocation can be divided into two parts, inter-sector reallocation and intra-sector reallocation. The inter-sector reallocation of labor and capital from the agricultural into the manufacturing sector is well documented in the literature. However, the intra-sector reallocation of resources may be an important determinant of an economy's ability to sustain high productivity growth rates as well as its ability to adapt to macroeconomic shocks. If producers in a sector or industry are not equally efficient in production, then a policy that encourages the growth and expansion of more efficient and the contraction and failure of less efficient firms will contribute to productivity improvements. This second pathway is much more difficult to document or quantify because it places large requirements on the data. Nothing short of micro-level panels will suffice.

This paper focuses on resource flows using firm-level data from the Manufacturing Censuses of Taiwan (China), for the years 1986 and 1991. Taiwan (China) is an interesting case because, in contrast to several of its struggling neighbors, it has so far escaped with a small devaluation of its currency and

modest declines in share prices. Economic performance remains strong. One of the main objectives of this paper is to understand to what extent Taiwan's industrial structure has contributed to its ability to withstand the storms. In addition, the vast majority of worker reallocation in Taiwan's manufacturing sector occurs between firms in the same industry. While the sector as a whole gained less than 9,000 workers in the period from 1986 to 1991, more than one million jobs were created and more than one million jobs were destroyed. Thus, analyzing inter-industry reallocations rather than inter-firm reallocations would greatly understate the economic importance of an efficient labor market.

Large scale job reallocation activity, brought about by the creation and destruction of jobs has been found to be typical of the labor markets which are fluid and flexible, moving resources toward their highest value uses. High rates of job creation and destruction also imply high levels of heterogeneity in the behavior of employment growth across firms with the former signaling enhanced employment opportunities and the latter greater job insecurity. With the exception of the U.S. labor market, very little is known about the magnitude of job creation and destruction rates, especially in developing countries.[1] The information about job creation and destruction rates will be useful in addressing the question of whether firms or industries that experience rapid productivity growth also experience lower job turnover but higher net employment growth rates. The answers to these and related questions can only be addressed with information about gross employment flows at the micro-level. The goal if this paper is to explore the pattern of reallocation of labor across firms and industries and relate it to the long run productivity growth for firms and industries.

## *I . The Empirical Issues*

As workers are reallocated from one firm to another, jobs are lost (destroyed) at contracting and exiting firms and found (created) at expanding and entering firms. This process of job creation and job destruction can be identified in the firm level census data. Firm level data play a critical role in

[1] The exception is the paper by Roberts (1996) on employment flows and producer turnover in Chile, Colombia and Morocco.

understanding the labor allocation process because they reveal information that is masked in more aggregated industry level data.

The most comprehensive study on gross job flows is by Davies, Haltiwanger and Schuh (1996) on plants in the U.S. manufacturing sector. The U.S. is widely perceived to operate with a highly flexible and fluid labor market with a continuous reshuffling of employment opportunities within and across sectors. This view of the U.S. economy is reinforced by the authors' finding of large scale job creation and destruction. They find that between 1973 and 1988 an average of 19.4% of all jobs are either created or destroyed annually. In separate work Haltiwanger (1997) finds that less than 9% of the variation of firms' growth rates can be explained by their industry classification. Therefore, the fortunes of any individual firm are only marginally affected by broad movements of expansion or contraction of its industry and are largely affected by its individual characteristics such as its size, productivity, age, location etc.

Among the many findings of Davies, et al., two stand out as relevant for our paper. First, they find that industries in the U.S. with high total factor productivity growth exhibit higher net employment growth. Second, they find that the conventional view about the job-creating ability of small enterprises is a misleading interpretation of the actual data. While small businesses share very high job creation rates with their larger counterparts, they also have much higher job destruction rates than larger firms. These findings for the U.S. prompt us to ask if the same patterns apply to Taiwan.

Like many developing countries, SMEs dominate the industrial structure of Taiwan's economy. However, unlike many developing countries, these enterprises have been important contributors to the economy's phenomenal growth in output, exports and productivity. Moreover, SMEs are often viewed as the driving force behind the economy's rapid transformation and growth, avoiding the complex organizational decisions of larger firms while at the same time, providing the flexibility to changing market conditions (Pack, 1992; Levy, 1988). Underlying the strength of these SMEs is the presumption that they are also the fountainhead of job creation, providing the justification for many preferential

treatments from the government. In addition to shedding new light on this alleged job-creating prowess os small businesses, we emphasize the importance of focusing on the magnitude of the intra-industry, firm level reallocation of jobs by addressing the general issue of which types of firms are most proficient at creating new jobs. In particular, we draw on the productivity literature to examine the relationship between job flows and productivity levels and growth of firms in general, and more specifically, cohorts of surviving and turnover firms.

Extensive work has been done using micro level data and developing theoretical models which provide a framework for thinking about changing populations of competitive firms. Jovanovic (1982) develops a model where firms update their beliefs of their own cost structure based on their realization of profits in each period. Firms with high costs will choose to exit while entrants randomly draw their cost structure from a known distribution. This model generates a continuously circulating population of firms with simultaneous entry and exit. In Hopenhyn (1992) a firm's productivity is a random variable drawn from a distribution that depends on its previous realization. Firms which realize productivity levels below a certain threshold conclude that they are indeed uncompetitive and exit the market. Again, potential entrants make entry decisions based on current market conditions, the market price that is generated by the current population of firms, and simultaneous entry and exit results. While these theories are not used explicitly in this paper, they provide the theoretical foundation to explain why firms are expanding, contracting, entering and exiting and therefore explains why an industry experiences job creation and destruction.

Using micro data on US manufacturing firms from 1972 to 1987, Baily, Hulten and Campbell (1992) found that in most industries the "within" firm productivity growth contributed almost all of the industry level productivity gains and that reallocation of market shares and turnover played only minor roles. This qualitative result was confirmed by several subsequent studies using data from different countries and modified decomposition techniques. Griliches and Regev (1995) find the same qualitative result among manufacturing firms in Israel as did, Liu (1993 ), Tybout (1996), and Liu and Tybout (1996)

using data from Chile and Columbia. Using US data, Haltiwanger (1997) confirms the importance of within firm productivity growth but finds a larger role for turnover than the others. The results from Aw, Chen and Roberts (1996), using Taiwanese data, differ dramatically from the others. They find that while within firm TFP growth is again important and between firm reallocation of market shares again has a negligible effect, the turnover effect is large in Taiwanese manufacturing industries. In all manufacturing industries they study, entrants have higher average TFP than exits and produce a larger share of output. On average, the turnover effect accounts for about one-third of total TFP growth in manufactures.

In this paper, we look more closely at whether job turnover in Taiwan translates into benefits, such as the efficiency gains from the replacement of low productivity with high productivity firms. If the answer is in the affirmative, then it follows that policies which attempt to reduce turnover of either firms or jobs are likely to generate lower productivity gains.

*II. Methodology and Measurement Issues*

To quantify the level of activity in the labor market we construct several standard industry-level measures of job creation and destruction. There are three basic, firm-level building blocks used to construct these industry-level measures. For each firm we calculate the net employment change by taking the difference between employment in year t+1 and year t. We also construct average employment by taking the (arithmetic) mean of the firm's employment in year t+1 and year t. For notational convenience let $E_{i,t}$ denote the employment of firm *i* in year *t*. The firm-level net rate of change is the net employment change divided by the average employment or,

$$\frac{E_{i,t+1} - E_{i,t}}{\frac{1}{2}\left(E_{i,t+1} + E_{i,t}\right)}.$$

Note that these measures can be calculated for firms which enter or exit the industry in the period of time between year t and year t+1. For example, a firm which enters during this period has zero employment in year t and average employment of $1/2E_{i,t+1}$.

Davis, Haltiwanger and Schuh (1996) outline the following, industry-level measures of job creation and destruction between year t and year t+1:

Gross Job Creation: The sum of all firm-level employment increases (including entering firms).

Gross Job Destruction: The (positive) sum of all firm-level employment decreases (including exiting firms).

Net Employment Change: The change in total, industry-level, employment (or Gross Job Creation less Gross Job Destruction).

Gross Job Reallocation: The total number of job changes (or Gross Job Creation plus Gross Job Destruction).

Minimum Worker Reallocation: The minimum number of workers who must change jobs to achieve the Gross Job Reallocation (or the larger of Gross Job Creation or Gross Job Destruction).

Excess Job Reallocation: The number of job changes beyond the minimum needed to achieve the Gross Job Reallocation (or Gross Job Reallocation less the absolute value of Net Employment Change).

Job Creation Rate: The sum of all positive firm-level net rates of change weighted by each firm's share of total employment.

Job Destruction Rate: The (positive) sum of all negative firm-level net rates of change weighted by each firm's share of total employment.

Net Job Creation Rate: The net growth of employment in the industry (or Job Creation Rate less the Job Destruction Rate).

Job Reallocation Rate: The sum of the Job Creation Rate and the Job Destruction Rate.

Excess Job Reallocation Rate: The Job Reallocation Rate less the Net Job Creation Rate.

We calculate TFP using an index method where the TFP of each firm is calculated relative to the performance of a hypothetical average firm. The index is linked across time based on the changes in the performance of each period's hypothetical average firm. This method is an application of Good, Nadiri and Sickles' (1996) extension of the basic multilateral indexing method developed by Caves, Christiansen and Diewert (1982).

Let $Y_{f,t}$ be the value of the output of firm $f$ in time $t$. Let $S_{f,t}$ be firm $f$'s input share of input $i$ and $X_{i,f,t}$ be firm $f$'s use of input $i$. An upper bar demotes the average across all firms in the industry in a given period. The natural log of firm $f$'s TFP in time $t$ is calculated as,

$$\ln TFP = \left(\ln Y_{f,t} - \overline{\ln Y_t}\right) + \sum_{s=2}^{t}\left(\overline{\ln Y_s} - \overline{\ln Y_{s-1}}\right)$$
$$- \left[\sum_{i=1}^{n}\frac{1}{2}\left(S_{i,f,t} - \overline{S_{i,t}}\right)\left(\ln X_{i,f,t} - \overline{\ln X_{i,t}}\right)\right]$$
$$+ \left[\sum_{s=2}^{t}\sum_{i=1}^{n}\frac{1}{2}\left(\overline{S_{i,s}} - \overline{S_{i,s-1}}\right)\left(\overline{\ln X_{i,s}} - \overline{\ln X_{i,s-1}}\right)\right]$$

The first term measures the firm's output relative to the average firm. The third term measures the firm's inputs relative to the average firm. The second and fourth term measures how the TFP of the average firm changes from one period to the next. Unlike some measures of TFP, this measure is calculated, not estimated, and this method does not assume that all firms to use the same production technology.

## *III. Job Flows in Taiwanese Manufacturing Sector*[2]

### A. Overall Rates of Job Turnover

Job creation and destruction rates are very large in Taiwan's manufacturing sector. From Table 1, the ten-industry job creation (destruction) rate average over the 5-year period is 62.3 (56.9) percent.

[2] All results pertain to the 10 major industries over the period from 1986 to 1991.

That is, in any given year, an average of about 12 in 100 manufacturing jobs open up, and a similar number disappear at different locations. This large scale reshuffling of employment opportunities is comparable to magnitudes reported in other market economies and is generally interpreted to reflect a flexible and fluid labor market. For example, the corresponding figure for U.S. manufacturing reported by Davis, Haltiwanger and Schuh is 10 in 100.

The net growth rates of job creation are negative in textiles, plastics and apparel while the rest have net job gains with the highest gains in machinery, fabricated metals and iron and steel industries. However, these net job growth rates in Table 1 clearly obscure the very large gross flows of job gains and losses. This is especially striking in the electric/electronics industry where the net job growth rate is only 3.9 percent, the result of taking the difference between a job creation rate of 56.5 percent and a job destruction rate of 52.6 percent. This pattern of strikingly large gross rates of job creation and destruction, many times the magnitude of the net figures, is found in every industry. This result mirrors the finding in virtually every other country for which micro-level gross employment flows have been done.

The highest job creation rates are experienced by the machinery (83.6%), fabricated metals (76.5%) and iron and steel (75.7%) industries while the highest job destruction rates are in the apparel (82.4%), plastics (81.6%) and textiles (74.7%) industries. These figures largely reflect the difference between growing and declining outputs in the two groups of industries.

A closer examination of the results in Table I indicate that both incumbent and turnover firms are responsible for the negative overall net job growth rates in the textile, apparel and plastic industries. In the remaining industries, the turnover cohorts are responsible for the bulk of the additional jobs in those industries. In fact, in four of the remaining seven industries with positive overall net job growth rates, incumbents' contributions are negative.

B. Magnitudes of Job Turnover

Table II reports the absolute number of job turnover by industry and cohort. Of the 1.89 million jobs that existed in 1986, only about 40% are retained jobs held in continuing firms. The remaining jobs are either lost through contraction of incumbents or shut downs. The vast majority of jobs in 1991 are from new jobs created from entrants into industry rather than from the expansion of existing firms. In fact, incumbent firms are net destroyers of jobs (-92,853) while turnover firms are net creators of jobs (101,690) yielding a positive net figure of 8,837 jobs added between 1986 and 1991. Again, these net figures hide the huge gross flows among both the incumbent and turnover firms. This finding is especially true in the electric and electronics industry where net job gain (17,748) is a tiny fraction of the jobs created (254,938) and jobs destroyed (237,190). We note that even in the declining industries of textiles and plastics, the figures for gross jobs created are very high.

Interesting cross-industry differences are observed in the pattern of job flows. In absolute terms, textiles, plastics and apparel experienced net job losses while the rest have net job gains with the highest gains in machinery, fabricated metals and iron and steel industries. These patterns are consistent with the relatively lower change in output (negative in apparel) in the former group of industries compared to the latter. Of all the industries with positive output growth rate, the electric/electronic industry ranks at the top with output growing at an average annual rate of over 20 percent in the last three decades.

In textiles, apparel and plastics, both incumbent and turnover firms are large net destroyers of jobs. This pattern is consistent with our previous observation of overall large declines in employment in these three industries. In the remaining industries the overall large net job gains by turnover firms are either reinforced by small, positive net job gains among incumbents (basic metal, non-electrical machinery) or offset small net job losses among incumbents (paper/publishing, chemicals and fabricated metals).

Finally, the pattern of job creation and destruction by cohort in the electric and electronics industry stands out. While job losses among incumbents in the industry are as large as those in the three

"declining" industries of textiles, apparel and plastics, this is overwhelmed by the even larger job gains from turnover suggesting the displacement of large numbers of incumbents by new entrants. This is not surprising in an industry undergoing rapid technological progress and growth.

Overall, if we remove the effect of firm turnover on the flow of jobs in Taiwan's manufacturing sector, the net creation of jobs in seven out of the ten industries would be negative. That is, with the exception of basic metal and non-electrical machinery, incumbent firms experience net job losses. This phenomenon is not only limited to industries experiencing overall declining employment but also industries with positive net rate of job growth. The positive net job growth rates observed in these latter industries are generated purely by new entrants.

C. A Comparison with Other Countries

In Table III, we compare the results for all firms in the manufacturing sector in Taiwan with those performed by Roberts (1996) for Chile, Colombia, Morocco and those for Canada and the U.S. by Baldwin, Dunne and Haltiwanger (1994). The figures for all manufacturing firms are further broken down into the contributions of the turnover firms and the incumbent firms. For the sake of comparability with results for the other countries which were based on annual data, column 2 gives the annual average rates calculated from the figures for the five-year Taiwanese Census.

Except for Morocco, each country experienced modest average changes in overall employment, varying from – 1.2 percent in the U.S. to .6 percent in Canada. Employment growth in Morocco was the strongest, averaging 6.5 percent over the period from 1984-89. Of primary interest in this study is the amount of micro-level turnover that lies behind these net changes in employment.

As is true of the gross flows of firms into and out of an industry, the average rates of gross additions and losses of jobs for all the countries under study are many times more than the net outcomes. The figures on gross additions and losses for Canada and the U.S. average about 10 percent annually while for the developing countries gross additions range from 12.1 percent for Taiwan to 18.6 percent for Morocco. Gross losses are also higher in developing countries ranging from 12 percent in Taiwan to 13.9

percent in Chile. Thus, turnover rates (the sums of gross additions and losses) in the four developing countries are about 25 to 50 percent larger than those for Canada and the U.S.

The bottom two thirds of table III contains the figures for job turnover rates of entering or exiting establishments relative to those of incumbent firms. The pattern in Taiwan is distinctly different from the other countries, with the exception of Morocco. In these other countries, expansions and contraction among incumbent establishments is the major source of turnover in the number of jobs, although the figures for plant entry/exit and the expansion and contraction of incumbent plants were much closer than in the other countries. In Taiwan, the turnover among entrants and exits contribute the bulk of total turnover of jobs. The ratio of entry/exit turnover to total turnover over all time periods were .19 for the U.S, .28 for Morocco, .37 for Chile, .47 for Colombia and .76 for Taiwan. These figures reflect in general a systematic difference in the importance of entry and exit in developing countries and the crucial role played by entry and exit for Taiwan specifically.

In summary, based on the figures in Table III, we find that the entry and exit of manufacturing firms clearly played a larger role as a source of employment fluctuations in developing countries relative to the U.S., with Taiwan being the clear frontrunner in terms of the magnitude of this role. These results are consistent with very low sunk entry and exit costs in Taiwan, as is likely with a market structure characterized by small firms operating within a dense network of subcontractors and trading firms, enabling firms to begin production with small amounts of capital. In countries such as the U.S., the much heavier concentration of employment in large, capital-intensive plants means that most variation in demand is met by changes in the size of incumbent plants.

### *IV. Job Flows, Total Factor Productivity Levels and Firm Size*

In a forceful departure from convention, Davis, Haltiwanger and Schuh (1996) provided empirical evidence refuting the claims about the job-creating prowess of small businesses in the U.S. They showed that while small businesses create new jobs at a much higher gross rate, they also destroy

jobs at a much higher rate than large employers. Thus, the authors find no systematic relationship between employer size and net job growth rate. These findings prompt us to ask if the same is true in Taiwan where small firms dominate and are believed to be the driving force behind the resilience and durability of the Taiwanese economy.

Before we address the question of the employment implications of firms of various sizes, it is clear from previous work using micro data that there is a high degree of heterogeneity among firms in a given industry in terms of different measures of economic performance. Clearly, firms that experience strong performance are very likely to have a different employment outcome than firms that undergo weaker performance, despite employment differences from firm size variation. In this paper, we use firm-level measures of total factor productivity (TFP) as a summary measure of firm efficiency. Given that firm productivity fluctuates from year to year because of the timing of investment and employment decisions and other factors, average TFP levels over the five-year census period from 1986 to 1991 provide a good approximation of firm efficiency relative to each other. For the same reason, firm size is measured as the average level of employment in the two census years, a better indicator of the firm's intended scale of operations than current employment.

Table IV reports net and gross job flows by quartiles of firm-level TFP distribution and employment distribution. Two striking patterns emerge in the analysis of the columns representing net job growth figures. First, in nine of the ten industries, smaller firms (those in the 25 and 50 mean employment quartile) significantly stronger rate of net job growth, for any given TFP level. For instance, in the textile industry, firms in the lowest size but highest TFP quartile have an average net job creation rate of 1.14 % compared to the corresponding figure of –0.28% in firms with similar productivity but in the highest size quartile. The same negative relationship between size and net job growth is observed in the productivity categories. Second, the lowest net job creation rates are observed firms in the top size quartile with below median TFP. Again, this pattern is observed in nine of the ten industries with the exception of the transport industry. Of these nine industries, the figures are negative in seven.

These results clearly indicate that small but highly productive firms have the most prolific net job growth rates and large, relatively unproductive firms are, not only net losers, but have the highest rates of net job loss. We note from examining the rest of table IV for the group of very productive but smaller firms, that they have the highest gross job creation rates in all ten industries coupled with the lowest gross job destruction rates in five of the ten industries. In contrast, gross job creation rates are lowest in the top size quartile in all ten industries while in five of the ten industries, these firms also destroy jobs at the highest rate relative to their smaller counterparts.

In examining the gross job creation rates in table IV, several patterns can be observed. First, the relationship between firm size and gross job creation is negative and monotonic, once we control for the level of average TFP: in every category of productivity level in all ten industries, smaller firms create jobs at a much higher rate than larger firms. This pattern is striking if one looks down each column representing the various percentiles of TFP in the table. If we compare the bottom and top quartile of the size distribution, the smallest firms create jobs at a rate that ranges from one and one-half times to seven times faster than firms in the top quartile.

The second striking pattern is that, except for firms in the top size quartile, average productivity levels are positively correlated with gross job creation rates once firm size is accounted for. This pattern is evident in the increase in the figures across the productivity columns for each firm size category. In the top size quartile, the productivity-job creation rates relationship is negative in half of the industries with firms in the lower productivity quartiles creating jobs at a much higher rate than their counterparts in the higher quartiles.

Do smaller firms destroy jobs at a higher rate than larger firms? The answer is in the affirmative generally in six of the ten industries. In the remaining industries, which are also the country's key manufacturing and export industries (textile, apparel, plastic, electric/electronics), firms in the top two size quartile have much higher job destruction rates than the bottom quartiles. That is, in these industries,

larger firms are the ones destroying jobs at a higher rate than smaller firms. This result is in stark contrast to the finding among U.S. manufacturing firms.

Our findings on gross job creation and destruction together imply that, for the four major Taiwanese industries of textile, apparel, plastic and electric/electronics, net job creation rates will be higher (lower) for firms that are below (above) the median size and have average productivity levels above (below) the median level. This pattern is generally borne out if one contrasts the northeast and southwest quadrants figures on net job creation rates in Table IV. We note that the figures in the former quadrant are always positive and large while just the reverse is true in the latter quadrant.

In the remaining industries, while the pattern is less systematic since smaller firms have both higher job creation and destruction rates, we still find a negative correlation between firm size and net job creation rates. That is, as firms get larger in size, their net creation of jobs fall when productivity levels are accounted for. This pattern holds in all but one (transport) industry.

In Table V we report the relationship between TFP growth and job flows. While job destruction rates, on average, fall with TFP growth rates, the lack of a systematic relationship between job creation rates and TFP growth suggest that the pattern of the relation between net job creation rates and TFP growth rates is going to be industry specific. For most industries where job creation rates generally rise with productivity growth, net job creation rates tend to be positively correlated with TFP growth. The opposite is true in the other industries such as clothing, basic metals and electric/electronics, where net job creation falls with higher productivity growth. The slowdown in output growth and hence employment growth appears to be the explanation behind the clothing industry whilst the substitution into other relatively less expensive inputs may be the underlying reason for the drop off in job growth in the basic metals and electric and electronics industries.

It is interesting to note that except for the basic metals and non-electric machinery industries, net job creation rates are negative in many of the TFP growth quartiles in the other industries. A breakdown of these rates into labor skill types (production and non-production workers) indicates positive and clearly

higher rates of net job creation among non-production jobs relative to production jobs. This pattern is true in all ten industries suggesting a clear increase in the share of more skilled jobs in the composition of the labor force permeating all of Taiwan's manufacturing industries.

To summarize, we find that there is a general tendency for firms with higher levels of productivity to have higher net job creation. This relationship is quite independent of firm size with the exception of those in the very top size quartile, where in half the cases the productivity-net job creation rate relationship is negative. We also find that the pattern of correlation between TFP growth and both measures of gross job flows is not uniform across the ten industries. That is, net job creation rates are associated with firms with higher productivity growth in some industries (textiles, plastics, and weakly in non-electric machinery and transport) but not in others. What is true across all ten industries, however, is that net job creation rates among workers with more skill are greater than job creation rates among relatively unskilled workers.

Our findings with respect to the firm size-job flows relationship indicate that, once we account for productivity levels, Taiwanese firms in the lower end of the size distribution, like their U.S. counterparts, create jobs at a higher rate than those in the upper end of the size distribution. However, unlike the U.S., our finding indicates lower job destruction rates are also evident among smaller firms in the country's four major industries. In these industries, the pattern is clearly one that is consistent with the belief that in Taiwan, small businesses are the fountainhead of job creation, contrary to the finding for the U.S. This result is also true for all the remaining industries with the exception of the transport industry. In this latter group of industries, despite the fact that smaller firms also destroy jobs at a higher rate, their net rate of job creation is still higher relative to their larger counterparts.

Kernel densities relating firm size and the three different measures of job flows in Figure 1 attached at the end of the paper, confirm the results reported in Table V. In the key industries of textiles, clothing, plastics, and electric/electronics, firm size is clearly negatively correlated with the net rate of job creation. This relationship in turn reflects very closely the relation between firm size and gross job

creation rates. In the bulk of the ten industries, gross job destruction rates are revealed to be only weakly (negatively) related to firm size.

*V. Job Flows and Exports*

We next analyze the relationship between job flow behavior and exposure to the export market. To do this we sort our two-digit manufacturing industries by the share of exports in total production. This average export intensity figure ranges from zero (non- exporters) to very high (75-100%) intensity exporters. We then examine how gross and net job flow rates differ by these measures. The results are presented in Table VI.

An examination of the net job creation rates by export intensity in Table VI reveals two clear patterns. First, firms that do not export at all rank as those with the highest rate of net job creation in every industry except the chemical industry where it came in second. Moreover, these rates are always positive. Second, negative rates of net job creation are evident among the bulk of exporters, particularly those that export more than 25% of total production. The employment declines are particularly large and noticeable in the textile, apparel and plastic industries, the same three industries that have recorded overall contraction in employment. The only industry where net job creation rates are positive for all levels of export intensity is machinery.

The above net job creation rates are driven by the large differences in gross creation rates across export intensity groups. Since the variation in rates across the industries is small, we compare the rates by export intensity for all the industries taken together. On average, non-exporters generate jobs at a rate that is almost two times higher than firms that export less than half of their total production. The latter group, on the other hand, has a gross job creation rate that is more than three times higher than those that export more than 50% of their output.

The pattern of job destruction rates across export intensity groups indicate that those that export less than half their output and non-exporters generally tend to have higher job destruction rates than firms

with higher export intensity. That is, even though exporters relative to their non-exporting counterparts, have much lower gross job creation rates, their jobs tend to last longer given the lower rates of job destruction rates among these firms. However, the differences in the magnitude of gross destruction rates across these export intensity groups are much smaller than differences in their gross job creation rates. Consequently, the figure for net job flows are driven much more by gross job creation rates.

Overall, non-exporters generate jobs at a much higher rate than exporters. The larger the export share, the weaker is the rate of net job creation. This result is surprising given the common view of the export sector as a prime contributor to employment growth. However, export jobs are more durable than those of non-exporters. We next examine the interaction among the export activity, firm size and productivity levels in determining job flow rates.

In Table VII, we report the job flow rates of exporters and non-exporters classified by firm employment and productivity levels. We focus on Taiwan's major exporting industries, i.e., textiles, apparel, plastics and electric/electronics. The signs and magnitudes of the figures for net job creation among exporters are very different than those for non-exporters. Among exporters, with very few exceptions, positive net job creation rates are generally limited to the smallest firms with above median productivity levels. The exception to this pattern is the electronics industry where positive net job creation are quite independent of employment size as long as productivity levels are above the median level.

In contrast, among the group of non-exporters, positive net job creation rates are a common phenomenon across firm size categories and productivity categories. With the exception of the plastic industry, a sufficient condition for net rates of job creation to be negative among non-exporters is to be in the bottom of the productivity quartile.

Despite the differences in these specific patterns in job flows between exporters and non-exporters, we find that exporters and non exporters alike, are more likely to have higher net job creation rates if they are located in the north east quadrant of each industry's table of net job creation rates. That

is, firms with below average employment but above average productivity are more likely to have stronger job creation prowess than their larger and less productive counterparts.

The way firm size interacts with productivity levels to yield the job flow rates for exporters and non-exporters is consistent with the pattern for all firms taken together. That is, higher net job creation rates are more likely to be among firms that are not only smaller in size but also have productivity levels that are above the median level for the industry. Firms that export a larger share of total production have more durable jobs than non-exporters or small exporters. The new and somewhat surprising result when we break down firms by their export status is that, in every industry, for a given size category and productivity category, non-exporters have higher net job creation rates than exporters.

Net job creation rates for non-exporters are also more likely to be positive in contrast to the dominance of negative figures among exporting firms. The main reason may be the difference in the relative factor intensities of exporters versus non-exporters as well as small firms relative to their larger counterparts. Export-intensive firms and large firms are generally more capital-intensive. The smallest (and negative) net job creation rates are found to be common among firms that export most of their output and at the same time, are in the top of the firm size quartile. The insight from table VII is that the apparent negative correlation between size and net job creation rates does not apply as stringently to high productivity non-exporters. This is clear by examining the very last column in the bottom half of the table. Except for firms in the top of the size quartile, the figures for net job creation are comparable among the most productive firms that span very different size classifications.

## VII. Summary and Conclusions

Our findings about the nature of net growth in employment among Taiwanese manufacturing firms indicate that unlike the U.S., there is evidence that, relative to large firms, SMEs are <u>not</u> net destroyers of jobs. While the rates of both job creation (in all ten industries) and destruction (in five industries) among small firms are higher than those for larger firms, the net job creation rates are

observed to be positive and decreasing with firm size. This is an important finding since like many developing countries, SMEs proliferate the industrial structure of Taiwan and are considered to be the backbone of the manufacturing sector.

The second finding is that on average, productivity levels are positively correlated with net job creation rates. The interesting feature that is hidden by the net figures across the industries is that this relationship is driven both by the strong negative relationship between gross job destruction rates and average TFP levels and by the strong positive relationship between cross job creation rates and productivity levels. That is, firms with higher productivity levels destroy jobs at a much lower rate relative those with lower average productivity. At the same time, more productive firms also have higher gross job creation rates.

When we combine information on firm size and productivity and calculated the rates of job flows, our results show that in Taiwan's key industries, firms with below median employment but above median total factor productivity have substantially higher rates of net job creation. This is because of higher gross job creation and lower rates of gross job destruction among these groups of firms.

Finally, producers for the domestic market appear to be the ones that create more jobs relative to those that export. More importantly, non-exporters also appear to destroy jobs at a slower rate relative to those that export more than 25% of production. Thus, the net rate of job creation is more likely to be not only higher but also positive for non-exporters or small exporters and negative for firms that export the bulk of their output. The smallest (and negative) net job creation rates are found to be common among firms that export most of their output and at the same time, are in the top of the firm size quartile.

Our results indicate that accounting for productivity levels is crucial in understanding the relationship between firm size and net job creation rates. Firm size per se is not as crucial as the level of productivity in determining the magnitude of job creation or destruction. In every size category, generally firms with higher productivity have higher job creation rates, lower job destruction rates, and thus higher net job creation rates than lower productivity firms. The only exception to this general rule

is among firms in the largest employment category where the relationship between productivity and job flow rates are more mixed.

Once we control for the level of productivity, our results indicate that, in contrast to the Davis et al. findings for the U.S., the relationship between firm size and job prowess is not mixed but clearly negative. Among Taiwanese manufacturing industries, we find that in every industry, smaller firms have higher gross job creation and in its major industries. Moreover, in the key industries, smaller firms also have lower gross job destruction rates. Consequently, there is no myth in the popular view in developing countries that smaller firms are indeed the driving force behind the creation of jobs. The necessary qualification to this statement that is clear from accounting for the productivity levels of the various cohorts of firms is that it is the more productive of the smaller firms that document the strongest net job performance. The weakest net job performance is generally found among low productivity firms in the top size quartile. Our results also indicate that exporters are not the most prolific job creators unless the firm is an exporter in the electronics industry. In general, the highest net job creation rates are found among non-exporters with above median productivity level.

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**Table I: Job Turnover Rates in Taiwan, by Industry and Cohort**

| All Firms | Textile | Clothing | Paper & Pub. | Chemicals | Plastic | Basic Metals | Fab. Metals | Non Elec. Mach. | Elec. Mach. | Transport |
|---|---|---|---|---|---|---|---|---|---|---|
| Net Growth Rate | -32.0 | -35.0 | 13.3 | 24.1 | -29.6 | 36.7 | 17.4 | 41.0 | 3.9 | 14.4 |
| Creation Rate | 42.6 | 47.4 | 61.4 | 65.9 | 52.0 | 75.7 | 76.5 | 83.6 | 56.5 | 61.5 |
| Destruction Rate | 74.7 | 82.4 | 48.0 | 41.9 | 81.6 | 38.9 | 59.1 | 42.6 | 52.6 | 47.1 |
| Reallocation Rate | 117.3 | 129.8 | 109.4 | 107.8 | 133.5 | 114.6 | 135.6 | 126.2 | 109.1 | 108.7 |
| Excess Reallocation Rate | 85.3 | 94.8 | 96.1 | 83.8 | 103.9 | 77.9 | 118.2 | 85.3 | 105.2 | 94.2 |
| Observations | 11910 | 5645 | 15344 | 1714 | 18778 | 6446 | 44820 | 19728 | 15609 | 7677 |
| **Turnover Cohort (Entry and Exit)** | | | | | | | | | | |
| Net Growth Rate | -18.1 | -17.8 | 14.8 | 24.6 | -21.7 | 30.9 | 18.2 | 36.4 | 9.6 | 13.9 |
| Creation Rate | 33.3 | 40.2 | 49.6 | 59.4 | 42.4 | 60.7 | 64.6 | 68.1 | 42.3 | 48.0 |
| Destruction Rate | 51.4 | 58.0 | 34.7 | 34.8 | 64.1 | 29.8 | 46.3 | 31.7 | 32.6 | 34.0 |
| Reallocation Rate | 84.8 | 98.2 | 84.3 | 94.1 | 106.5 | 90.5 | 110.9 | 99.8 | 74.9 | 82.0 |
| Excess Reallocation Rate | 66.6 | 80.4 | 69.5 | 69.5 | 84.8 | 59.6 | 92.6 | 63.4 | 65.3 | 68.1 |
| Observations | 8595 | 4474 | 10337 | 1327 | 14293 | 5349 | 33971 | 14969 | 12244 | 5944 |
| **Continuing Firms** | | | | | | | | | | |
| Net Growth Rate | -24.1 | -33.7 | -2.6 | -1.0 | -16.8 | 10.6 | -2.0 | 9.1 | -9.1 | 0.8 |
| Creation Rate | 16.2 | 14.2 | 20.4 | 12.5 | 20.5 | 27.3 | 26.7 | 30.9 | 22.8 | 23.0 |
| Destruction Rate | 40.3 | 47.9 | 23.0 | 13.4 | 37.3 | 16.7 | 28.7 | 21.8 | 31.9 | 22.2 |
| Reallocation Rate | 56.5 | 62.1 | 43.4 | 25.9 | 57.8 | 44.0 | 55.4 | 52.7 | 54.7 | 45.2 |
| Excess Reallocation Rate | 32.3 | 28.4 | 40.8 | 24.9 | 41.0 | 33.3 | 53.4 | 43.6 | 45.6 | 44.4 |
| Observations | 3315 | 1171 | 5007 | 387 | 4485 | 1097 | 10849 | 4759 | 3365 | 1733 |

**Table II:**

| All Firms | Manufact. | Textiles | Clothing | Paper & Pub. | Chem. | Plastics | Basic Metals | Fab. Metals | Non Elec. Mach. | Elec. Mach. | Trans. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Labor 1986 | 1889963 | 281741 | 144840 | 109327 | 58246 | 301039 | 77439 | 240375 | 114005 | 442271 | 120680 |
| Labor 1991 | 1898800 | 203988 | 101701 | 124957 | 74185 | 223413 | 112279 | 286094 | 172713 | 460019 | 139451 |
| Retained Jobs | 757102 | 100437 | 43248 | 53054 | 30517 | 87142 | 40506 | 84824 | 52896 | 205081 | 59397 |
| Crated Jobs | 1141698 | 103551 | 58453 | 71903 | 43668 | 136271 | 71773 | 201270 | 119817 | 254938 | 80054 |
| Destroyed Jobs | 1132861 | 181304 | 101592 | 56273 | 27729 | 213897 | 36933 | 155551 | 61109 | 237190 | 61283 |
| Net Change | 8837 | -77753 | -43139 | 15630 | 15939 | -77626 | 34840 | 45719 | 58708 | 17748 | 18771 |
| Observations | 147671 | 11910 | 5645 | 15344 | 1714 | 18778 | 6446 | 44820 | 19728 | 15609 | 7677 |
| **Turnover (Entry and Exit)** | | | | | | | | | | | |
| Labor 1986 | 815495 | 124916 | 71542 | 40700 | 23025 | 168157 | 28281 | 121901 | 45450 | 147259 | 44264 |
| Labor 1991 | 917185 | 80924 | 49551 | 58089 | 39302 | 111139 | 57604 | 169933 | 97645 | 190614 | 62384 |
| Crated Jobs | 917185 | 80924 | 49551 | 58089 | 39302 | 111139 | 57604 | 169933 | 97645 | 190614 | 62384 |
| Destroyed Jobs | 815495 | 124916 | 71542 | 40700 | 23025 | 168157 | 28281 | 121901 | 45450 | 147259 | 44264 |
| Net Change | 101690 | -43992 | -21991 | 17389 | 16277 | -57018 | 29323 | 48032 | 52195 | 43355 | 18120 |
| Observations | 111503 | 8595 | 4474 | 10337 | 1327 | 14293 | 5349 | 33971 | 14969 | 12244 | 5944 |
| **Between (Continuing Firms)** | | | | | | | | | | | |
| Labor 1986 | 1074468 | 156825 | 73298 | 68627 | 35221 | 132882 | 49158 | 118474 | 68555 | 295012 | 76416 |
| Labor 1991 | 981615 | 123064 | 52150 | 66868 | 34883 | 112274 | 54675 | 116161 | 75068 | 269405 | 77067 |
| Retained Jobs | 757102 | 100437 | 43248 | 53054 | 30517 | 87142 | 40506 | 84824 | 52896 | 205081 | 59397 |
| Crated Jobs | 224513 | 22627 | 8902 | 13814 | 4366 | 25132 | 14169 | 31337 | 22172 | 64324 | 17670 |
| Destroyed Jobs | 317366 | 56388 | 30050 | 15573 | 4704 | 45740 | 8652 | 33650 | 15659 | 89931 | 17019 |
| Net Change | -92853 | -33761 | -21148 | -1759 | -338 | -20608 | 5517 | -2313 | 6513 | -25607 | 651 |
| Observations | 36168 | 3315 | 1171 | 5007 | 387 | 4485 | 1097 | 10849 | 4759 | 3365 | 1733 |

**Table III : Job flow Rates, by Country and Cohort**

| All Manufacturing | Taiwan (1986 -91) | Chile (1979-86) | Colombia (1977-91) | Morocco (1984-89) | Canada (1973- 86) | U. S. (1973-86) |
|---|---|---|---|---|---|---|
| | Annual Average | | | | | |
| Growth Rate | 0.1 | -1.0 | 0.3 | 6.5 | 0.6 | -1.2 |
| Creation Rate | 12.1 | 12.9 | 12.5 | 18.6 | 10.6 | 9.2 |
| Destruction Rate | 12.0 | 13.9 | 12.2 | 12.1 | 10.0 | 10.4 |
| Reallocation Rate | 24.0 | 26.8 | 24.6 | 30.7 | 20.5 | 19.6 |
| Excess Reallocation Rate | 23.9 | 18.4 | 22.2 | 24.2 | 17.8 | 15.3 |
| **Entry and Exit** | | | | | | |
| Growth Rate | 1.1 | -2.0 | 0.2 | 4.3 | | -1.1 |
| Creation Rate | 9.7 | | | | | |
| Destruction Rate | 8.6 | | | | | |
| Reallocation Rate | 18.3 | 9.8 | 11.6 | 8.9 | | 3.7 |
| Excess Reallocation Rate | 17.2 | 6.5 | 10.7 | 4.6 | | 2.7 |
| **Expansion and Contraction** | | | | | | |
| Growth Rate | -1.0 | 1.1 | 0.1 | 2.2 | | -0.1 |
| Creation Rate | 2.4 | | | | | |
| Destruction Rate | 3.4 | | | | | |
| Reallocation Rate | 5.7 | 17.1 | 13.0 | 21.8 | | 15.9 |
| Excess Reallocation Rate | 4.7 | 11.6 | 10.9 | 18.5 | | 11.8 |

**Table IV: Job Flow Rates by Mean TFP quartiles and Mean Employment quartiles**

| Industry | Mean Employment Quartile | Job Creation Rate Mean TFP Quartile 25 | 50 | 75 | 100 | Job Destruction Rate Mean TFP Quartile 25 | 50 | 75 | 100 | Net Job Creation Rate Mean TFP Quartile 25 | 50 | 75 | 100 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Textiles | **25** | 0.69 | 1.22 | 1.60 | 1.56 | 1.16 | 0.66 | 0.33 | 0.42 | -0.47 | 0.56 | 1.27 | 1.14 |
| | **50** | 0.50 | 0.84 | 1.38 | 1.46 | 1.14 | 0.86 | 0.43 | 0.43 | -0.64 | -0.02 | 0.95 | 1.03 |
| | **75** | 0.46 | 0.61 | 0.85 | 1.20 | 1.10 | 0.87 | 0.67 | 0.59 | -0.65 | -0.27 | 0.18 | 0.61 |
| | **100** | 0.17 | 0.32 | 0.24 | 0.32 | 1.58 | 1.05 | 0.95 | 0.60 | -1.40 | -0.73 | -0.71 | -0.28 |
| Clothing | **25** | 0.74 | 1.09 | 1.49 | 1.44 | 1.15 | 0.74 | 0.42 | 0.54 | -0.41 | 0.35 | 1.07 | 0.90 |
| | **50** | 0.62 | 0.78 | 1.10 | 1.52 | 1.05 | 0.91 | 0.74 | 0.48 | -0.43 | -0.13 | 0.36 | 1.05 |
| | **75** | 0.62 | 0.48 | 0.83 | 1.18 | 0.97 | 1.11 | 0.84 | 0.70 | -0.35 | -0.63 | -0.01 | 0.48 |
| | **100** | 0.35 | 0.36 | 0.20 | 0.36 | 1.35 | 1.07 | 0.87 | 0.73 | -1.00 | -0.71 | -0.67 | -0.38 |
| Paper/Pub. | **25** | 1.06 | 1.16 | 1.25 | 1.13 | 0.81 | 0.71 | 0.68 | 0.84 | 0.25 | 0.45 | 0.57 | 0.29 |
| | **50** | 0.91 | 1.00 | 1.11 | 1.27 | 0.67 | 0.62 | 0.65 | 0.64 | 0.24 | 0.38 | 0.46 | 0.64 |
| | **75** | 0.82 | 0.75 | 0.82 | 1.05 | 0.54 | 0.55 | 0.62 | 0.66 | 0.29 | 0.20 | 0.20 | 0.39 |
| | **100** | 0.71 | 0.75 | 0.51 | 0.42 | 0.54 | 0.40 | 0.46 | 0.42 | 0.17 | 0.36 | 0.05 | 0.00 |
| Chemicals | **25** | 0.76 | 1.00 | 1.17 | 1.12 | 1.13 | 0.93 | 0.83 | 0.85 | -0.37 | 0.07 | 0.35 | 0.27 |
| | **50** | 0.72 | 0.89 | 1.35 | 1.46 | 1.02 | 0.87 | 0.51 | 0.36 | -0.30 | 0.02 | 0.84 | 1.10 |
| | **75** | 0.54 | 0.88 | 0.92 | 1.31 | 1.05 | 0.70 | 0.64 | 0.36 | -0.51 | 0.18 | 0.27 | 0.95 |
| | **100** | 0.22 | 0.25 | 0.17 | 0.87 | 1.18 | 0.85 | 0.52 | 0.25 | -0.96 | -0.60 | -0.35 | 0.62 |
| Plastics | **25** | 1.11 | 1.24 | 1.47 | 1.53 | 0.78 | 0.68 | 0.48 | 0.45 | 0.33 | 0.56 | 1.00 | 1.08 |
| | **50** | 0.93 | 1.04 | 1.26 | 1.48 | 0.76 | 0.66 | 0.52 | 0.42 | 0.17 | 0.38 | 0.74 | 1.06 |
| | **75** | 0.80 | 0.80 | 0.93 | 1.20 | 0.74 | 0.65 | 0.60 | 0.55 | 0.06 | 0.15 | 0.33 | 0.64 |
| | **100** | 0.53 | 0.34 | 0.32 | 0.37 | 1.16 | 1.06 | 0.91 | 0.79 | -0.63 | -0.72 | -0.59 | -0.42 |
| Basic Metals | **25** | 1.21 | 1.35 | 1.33 | 1.41 | 0.70 | 0.63 | 0.66 | 0.59 | 0.51 | 0.71 | 0.67 | 0.82 |
| | **50** | 1.20 | 1.10 | 1.31 | 1.44 | 0.62 | 0.75 | 0.58 | 0.50 | 0.58 | 0.36 | 0.73 | 0.94 |
| | **75** | 1.15 | 1.16 | 1.30 | 1.37 | 0.57 | 0.50 | 0.48 | 0.47 | 0.58 | 0.66 | 0.82 | 0.90 |
| | **100** | 0.83 | 0.61 | 0.39 | 0.87 | 0.87 | 0.83 | 0.27 | 0.25 | -0.04 | -0.23 | 0.13 | 0.62 |
| Fab. Metals | **25** | 1.04 | 1.07 | 1.26 | 1.39 | 0.86 | 0.84 | 0.69 | 0.59 | 0.18 | 0.23 | 0.57 | 0.80 |
| | **50** | 0.77 | 0.84 | 1.15 | 1.35 | 0.76 | 0.72 | 0.59 | 0.56 | 0.01 | 0.13 | 0.56 | 0.78 |
| | **75** | 0.84 | 0.85 | 0.99 | 1.32 | 0.71 | 0.61 | 0.56 | 0.48 | 0.13 | 0.24 | 0.43 | 0.83 |
| | **100** | 0.72 | 0.66 | 0.61 | 0.66 | 0.77 | 0.75 | 0.63 | 0.49 | -0.04 | -0.09 | -0.03 | 0.16 |
| Machinery | **25** | 1.22 | 1.19 | 1.26 | 1.43 | 0.69 | 0.74 | 0.71 | 0.55 | 0.54 | 0.45 | 0.55 | 0.87 |
| | **50** | 1.06 | 1.07 | 1.17 | 1.34 | 0.65 | 0.62 | 0.63 | 0.59 | 0.40 | 0.45 | 0.53 | 0.76 |
| | **75** | 1.06 | 0.96 | 1.15 | 1.26 | 0.53 | 0.52 | 0.46 | 0.50 | 0.54 | 0.44 | 0.69 | 0.76 |
| | **100** | 0.91 | 0.67 | 0.74 | 0.68 | 0.51 | 0.51 | 0.34 | 0.35 | 0.40 | 0.16 | 0.40 | 0.32 |
| Electronics | **25** | 0.91 | 1.32 | 1.64 | 1.66 | 0.98 | 0.62 | 0.33 | 0.33 | -0.07 | 0.70 | 1.31 | 1.33 |
| | **50** | 0.74 | 1.12 | 1.43 | 1.73 | 1.03 | 0.65 | 0.40 | 0.23 | -0.30 | 0.47 | 1.03 | 1.50 |
| | **75** | 0.60 | 0.82 | 1.13 | 1.61 | 1.10 | 0.73 | 0.48 | 0.24 | -0.50 | 0.09 | 0.65 | 1.37 |
| | **100** | 0.22 | 0.26 | 0.34 | 0.57 | 1.50 | 1.02 | 0.46 | 0.27 | -1.28 | -0.76 | -0.12 | 0.30 |
| Transport | **25** | 1.32 | 1.12 | 1.10 | 1.08 | 0.58 | 0.79 | 0.89 | 0.92 | 0.74 | 0.34 | 0.20 | 0.16 |
| | **50** | 1.23 | 1.07 | 1.01 | 1.11 | 0.54 | 0.68 | 0.84 | 0.84 | 0.70 | 0.38 | 0.16 | 0.27 |
| | **75** | 1.11 | 1.04 | 1.02 | 0.93 | 0.48 | 0.58 | 0.64 | 0.81 | 0.62 | 0.46 | 0.38 | 0.12 |
| | **100** | 1.06 | 0.74 | 0.50 | 0.40 | 0.48 | 0.55 | 0.71 | 0.28 | 0.58 | 0.19 | -0.21 | 0.12 |

**Table V: Job Flows Rates, by Weighted TFP Growth**

| | Textile | Clothing | Paper & Pub. | Chemical | Plastics | Basic Metals | Fab. Metals | Non Elec. Mach. | Elec. Mach. | Transport |
|---|---|---|---|---|---|---|---|---|---|---|
| **Creation Rate** | | | | | | | | | | |
| Bottom | 0.09 | 0.21 | 0.18 | 0.09 | 0.15 | 0.34 | 0.29 | 0.33 | 0.34 | 0.21 |
| Second | 0.19 | 0.20 | 0.16 | 0.15 | 0.22 | 0.45 | 0.21 | 0.30 | 0.29 | 0.20 |
| Third | 0.16 | 0.16 | 0.24 | 0.22 | 0.22 | 0.27 | 0.24 | 0.31 | 0.27 | 0.32 |
| Top | 0.17 | 0.09 | 0.22 | 0.12 | 0.24 | 0.22 | 0.28 | 0.32 | 0.18 | 0.23 |
| **Destruction Rate** | | | | | | | | | | |
| Bottom | 0.51 | 0.48 | 0.19 | 0.12 | 0.48 | 0.19 | 0.28 | 0.22 | 0.26 | 0.19 |
| Second | 0.30 | 0.45 | 0.26 | 0.14 | 0.32 | 0.16 | 0.27 | 0.23 | 0.33 | 0.31 |
| Third | 0.46 | 0.42 | 0.26 | 0.16 | 0.30 | 0.20 | 0.22 | 0.22 | 0.33 | 0.35 |
| Top | 0.30 | 0.42 | 0.20 | 0.15 | 0.27 | 0.13 | 0.27 | 0.17 | 0.30 | 0.11 |
| **Net Growth Rate** | | | | | | | | | | |
| Bottom | -0.42 | -0.27 | -0.01 | -0.03 | -0.33 | 0.15 | 0.00 | 0.11 | 0.08 | 0.02 |
| Second | -0.11 | -0.25 | -0.10 | 0.01 | -0.09 | 0.29 | -0.06 | 0.07 | -0.05 | -0.12 |
| Third | -0.30 | -0.26 | -0.02 | 0.06 | -0.08 | 0.07 | 0.02 | 0.09 | -0.06 | -0.03 |
| Top | -0.13 | -0.33 | 0.01 | -0.03 | -0.03 | 0.09 | 0.01 | 0.15 | -0.12 | 0.12 |

Quartiles of TFP Growth are constructed by weighting the TFP growth of each firm by the average of its shares of the labor force in the two years. From this distribution firms are divided into quartiles.

**Table VI: Rates of Job Flows by Average Export Intensities**

| Industry | Job Creation Rate<br>Average Export Intensity | | | | |
|---|---|---|---|---|---|
| | Non-Exporters | 0 to 25% | 25 to 50% | 50 to 75% | 75 to 100% |
| Textiles | 0.76 | 0.39 | 0.32 | 0.09 | 0.08 |
| Clothing | 0.85 | 0.72 | 0.39 | 0.17 | 0.07 |
| Paper/Pub. | 0.69 | 0.43 | 0.33 | 0.04 | 0.10 |
| Chemicals | 0.82 | 0.80 | 0.39 | 0.00 | 0.10 |
| Plastics | 0.89 | 0.52 | 0.31 | 0.10 | 0.09 |
| Basic Metals | 1.02 | 0.47 | 0.72 | 0.08 | 0.10 |
| Fab. Metals | 0.92 | 0.65 | 0.60 | 0.19 | 0.25 |
| Machinery | 1.02 | 0.78 | 0.66 | 0.28 | 0.21 |
| Electronics | 1.05 | 0.61 | 0.52 | 0.28 | 0.17 |
| Transport | 0.90 | 0.38 | 0.64 | 0.39 | 0.16 |
| **Industry** | **Job Destruction Rate**<br>Average Export Intensity | | | | |
| | Non-Exporters | 0 to 25% | 25 to 50% | 50 to 75% | 75 to 100% |
| Textiles | 0.73 | 0.72 | 0.98 | 0.36 | 0.60 |
| Clothing | 0.76 | 0.70 | 1.44 | 0.32 | 0.45 |
| Paper/Pub. | 0.53 | 0.36 | 0.49 | 0.16 | 0.30 |
| Chemicals | 0.58 | 0.52 | 0.17 | 0.13 | 0.11 |
| Plastics | 0.60 | 0.59 | 1.20 | 0.31 | 0.56 |
| Basic Metals | 0.53 | 0.21 | 0.56 | 0.44 | 0.22 |
| Fab. Metals | 0.59 | 0.52 | 0.93 | 0.27 | 0.25 |
| Machinery | 0.49 | 0.38 | 0.48 | 0.14 | 0.18 |
| Electronics | 0.57 | 0.57 | 0.72 | 0.33 | 0.35 |
| Transport | 0.60 | 0.24 | 0.76 | 0.16 | 0.35 |
| **Industry** | **Net Rate of Change**<br>Average Export Intensity | | | | |
| | Non-Exporters | 0 to 25% | 25 to 50% | 50 to 75% | 75 to 100% |
| Textiles | 0.02 | -0.33 | -0.66 | -0.27 | -0.52 |
| Clothing | 0.10 | 0.02 | -1.06 | -0.15 | -0.38 |
| Paper/Pub. | 0.16 | 0.06 | -0.16 | -0.12 | -0.20 |
| Chemicals | 0.24 | 0.27 | 0.22 | -0.13 | -0.02 |
| Plastics | 0.28 | -0.07 | -0.89 | -0.20 | -0.48 |
| Basic Metals | 0.50 | 0.26 | 0.16 | -0.36 | -0.13 |
| Fab. Metals | 0.33 | 0.13 | -0.33 | -0.08 | 0.00 |
| Machinery | 0.52 | 0.40 | 0.18 | 0.14 | 0.03 |
| Electronics | 0.48 | 0.04 | -0.19 | -0.05 | -0.18 |
| Transport | 0.30 | 0.13 | -0.12 | 0.23 | -0.19 |

**Table VII : Job Flow Rates By Firm Size and Average TFP Quartiles in Taiwan's Major Export Industries**

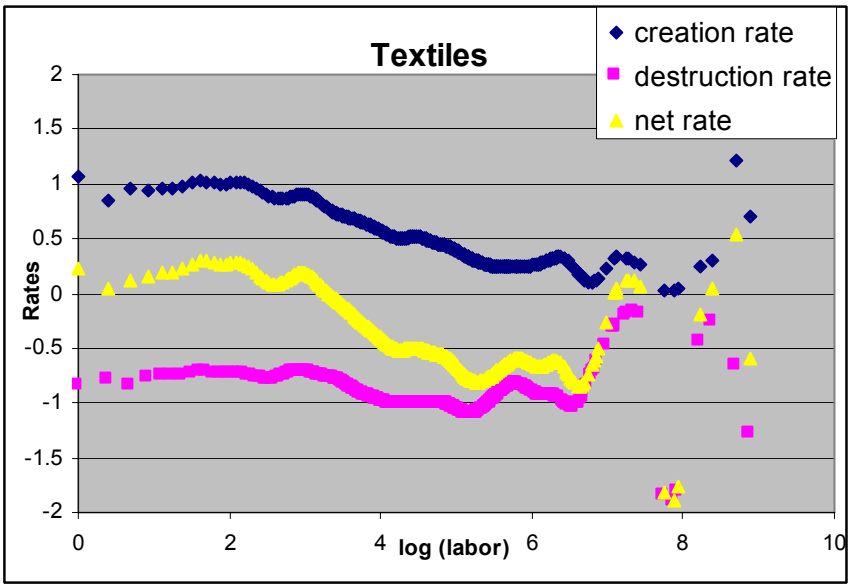
**All Firms that Export in at Least One Year**

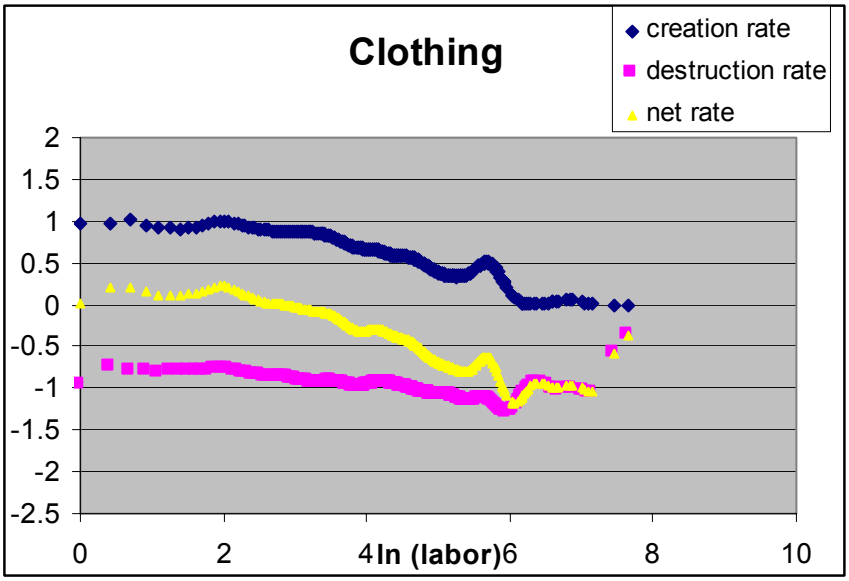
| | | Creation Rate Average TAP Quartile | | | | Destruction Rate Average TAP Quartile | | | | Net Rate Average TAP Quartile | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Size Quartile** | **25** | **50** | **75** | **100** | **25** | **50** | **75** | **100** | **25** | **50** | **75** | **100** |
| Textiles | **25** | 0.50 | 0.92 | 1.02 | 1.20 | 1.22 | 0.80 | 0.80 | 0.71 | -0.72 | 0.12 | 0.22 | 0.50 |
| | **50** | 0.44 | 0.46 | 0.67 | 0.98 | 1.09 | 1.02 | 0.88 | 0.77 | -0.66 | -0.56 | -0.21 | 0.21 |
| | **75** | 0.26 | 0.24 | 0.43 | 0.55 | 1.22 | 1.11 | 0.92 | 1.03 | -0.96 | -0.87 | -0.50 | -0.47 |
| | **100** | 0.33 | 0.16 | 0.10 | 0.41 | 1.24 | 1.12 | 0.54 | 0.59 | -0.92 | -0.96 | -0.44 | -0.18 |
| Clothing | **25** | 0.54 | 0.91 | 1.06 | 1.26 | 1.22 | 0.91 | 0.87 | 0.74 | -0.68 | 0.00 | 0.20 | 0.52 |
| | **50** | 0.40 | 0.38 | 1.15 | 0.93 | 1.30 | 1.24 | 0.67 | 0.98 | -0.90 | -0.87 | 0.48 | -0.05 |
| | **75** | 0.24 | 0.35 | 0.58 | 0.83 | 1.33 | 1.04 | 1.16 | 0.86 | -1.09 | -0.69 | -0.58 | -0.03 |
| | **100** | 0.30 | 0.07 | 0.08 | 0.30 | 1.16 | 1.31 | 0.62 | 0.70 | -0.86 | -1.24 | -0.54 | -0.41 |
| Plastics | **25** | 0.68 | 0.84 | 1.14 | 1.37 | 0.98 | 0.78 | 0.72 | 0.56 | -0.30 | 0.06 | 0.42 | 0.80 |
| | **50** | 0.59 | 0.60 | 0.72 | 0.96 | 0.89 | 0.73 | 0.80 | 0.68 | -0.30 | -0.13 | -0.08 | 0.28 |
| | **75** | 0.36 | 0.40 | 0.50 | 0.68 | 1.07 | 0.90 | 0.84 | 0.77 | -0.71 | -0.51 | -0.34 | -0.08 |
| | **100** | 0.19 | 0.12 | 0.11 | 0.30 | 1.45 | 1.03 | 1.09 | 0.73 | -1.26 | -0.90 | -0.97 | -0.43 |
| Electronics | **25** | 0.95 | 1.09 | 1.13 | 1.47 | 0.61 | 0.82 | 0.87 | 0.75 | -0.51 | 0.44 | 0.77 | 1.39 |
| | **50** | 0.76 | 0.95 | 0.96 | 1.19 | 0.65 | 0.59 | 0.90 | 0.69 | -0.72 | -0.12 | 0.59 | 1.25 |
| | **75** | 0.59 | 0.73 | 0.61 | 0.70 | 0.58 | 0.65 | 0.57 | 0.52 | -0.87 | -0.29 | 0.34 | 0.90 |
| | **100** | 0.32 | 0.81 | 0.51 | 0.49 | 0.42 | 0.47 | 0.37 | 0.23 | -1.39 | -0.46 | -0.08 | 0.20 |

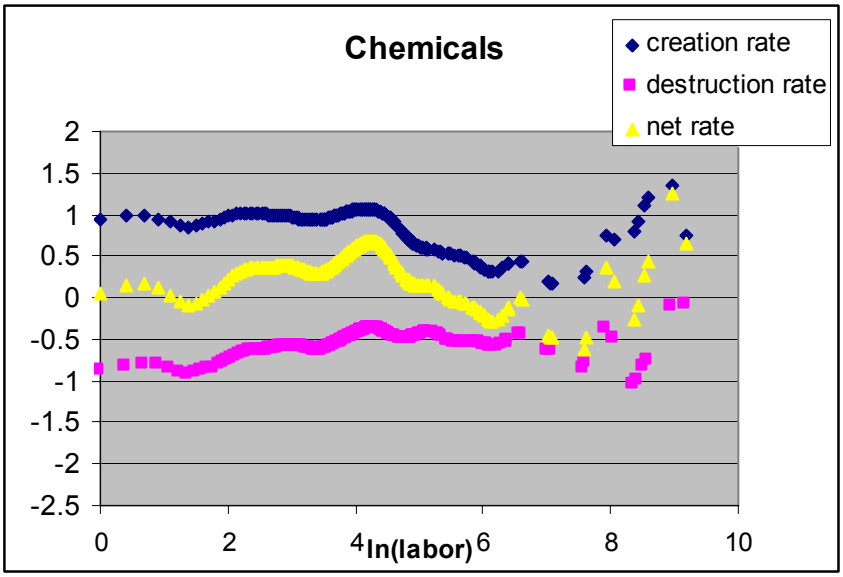
**All Firms that Do Not Export in Either Year**

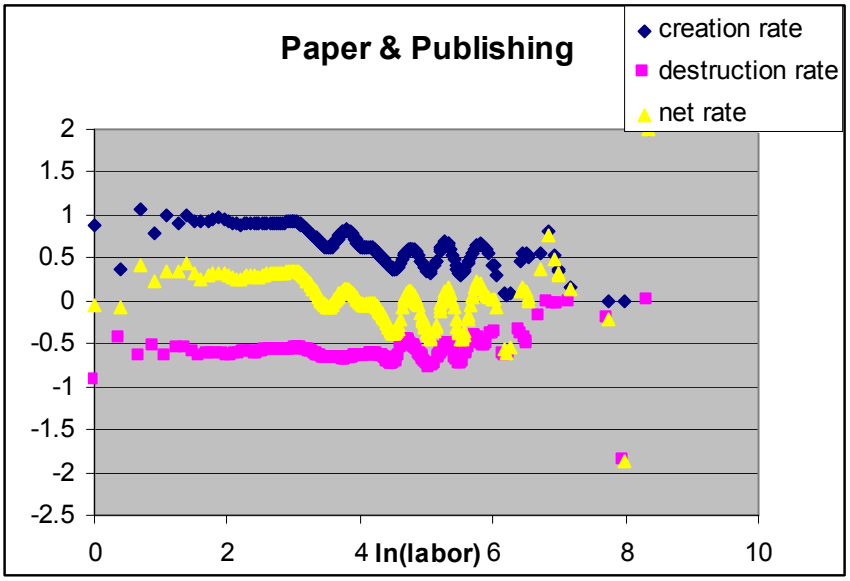
| | | Average TFP Quartiles | | | | Average TFP Quartiles | | | | Average TFP Quartiles | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Industry | **Size Quartile** | **25** | **50** | **75** | **100** | **25** | **50** | **75** | **100** | **25** | **50** | **75** | **100** |
| Textiles | **25** | 0.65 | 1.06 | 1.54 | 1.6 | 1.26 | 0.82 | 0.38 | 0.38 | -0.61 | 0.24 | 1.16 | 1.21 |
| | **50** | 0.56 | 0.89 | 1.36 | 1.61 | 1.07 | 0.81 | 0.46 | 0.34 | -0.51 | 0.08 | 0.9 | 1.27 |
| | **75** | 0.41 | 0.69 | 1.13 | 1.51 | 1.31 | 0.88 | 0.55 | 0.32 | -0.89 | -0.19 | 0.58 | 1.19 |
| | **100** | 0.28 | 0.4 | 0.58 | 0.83 | 1.36 | 1.04 | 0.72 | 0.56 | -1.08 | -0.65 | -0.13 | 0.27 |
| Clothing | **25** | 0.72 | 1.1 | 1.34 | 1.46 | 1.19 | 0.83 | 0.54 | 0.47 | -0.47 | 0.27 | 0.79 | 0.99 |
| | **50** | 0.68 | 0.85 | 1.17 | 1.57 | 1.07 | 0.89 | 0.57 | 0.38 | -0.39 | -0.04 | 0.59 | 1.19 |
| | **75** | 0.57 | 0.6 | 0.9 | 1.44 | 1.01 | 0.96 | 0.79 | 0.5 | -0.44 | -0.35 | 0.11 | 0.93 |
| | **100** | 0.58 | 0.44 | 0.84 | 1 | 1 | 1.16 | 0.7 | 0.54 | -0.41 | -0.73 | 0.14 | 0.46 |
| Plastics | **25** | 1.14 | 1.31 | 1.47 | 1.58 | 0.8 | 0.65 | 0.5 | 0.4 | 0.34 | 0.67 | 0.97 | 1.18 |
| | **50** | 1.02 | 1.07 | 1.32 | 1.48 | 0.73 | 0.69 | 0.52 | 0.44 | 0.29 | 0.38 | 0.8 | 1.04 |
| | **75** | 0.8 | 0.91 | 0.99 | 1.41 | 0.73 | 0.61 | 0.59 | 0.4 | 0.07 | 0.31 | 0.41 | 1 |
| | **100** | 0.74 | 0.61 | 0.59 | 0.94 | 0.86 | 0.77 | 0.67 | 0.45 | -0.12 | -0.15 | -0.08 | 0.49 |
| Electronics | **25** | 0.89 | 1.24 | 1.56 | 1.66 | 1.01 | 0.68 | 0.4 | 0.33 | -0.12 | 0.56 | 1.17 | 1.32 |
| | **50** | 0.75 | 1.08 | 1.52 | 1.76 | 1.07 | 0.77 | 0.35 | 0.22 | -0.33 | 0.32 | 1.17 | 1.54 |
| | **75** | 0.77 | 0.99 | 1.39 | 1.74 | 0.98 | 0.65 | 0.42 | 0.2 | -0.21 | 0.33 | 0.96 | 1.54 |
| | **100** | 0.52 | 0.67 | 0.88 | 1.31 | 1.08 | 0.85 | 0.5 | 0.27 | -0.55 | -0.18 | 0.38 | 1.04 |

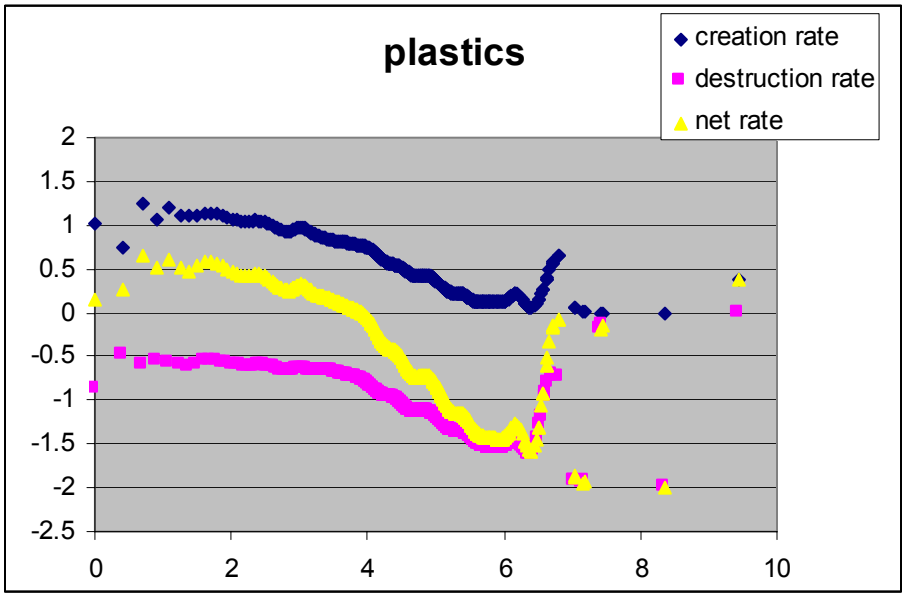
**Figure 1**

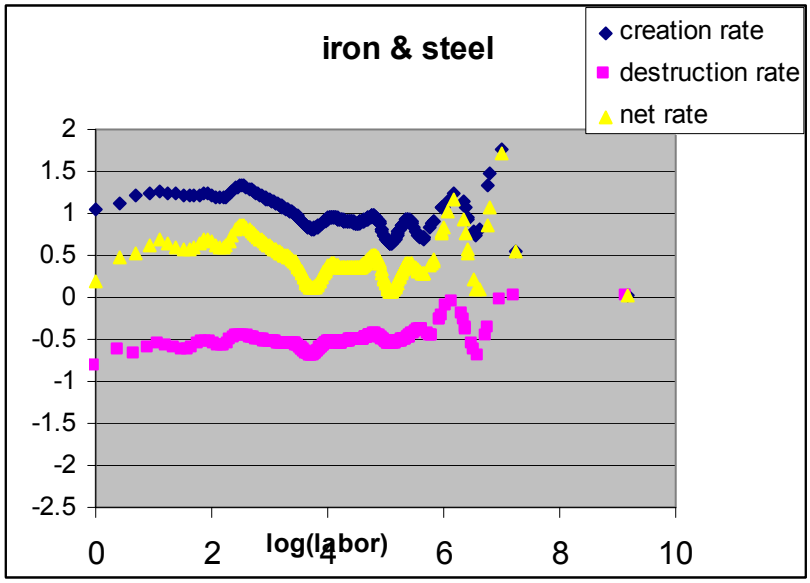

Textiles
creation rate
destruction rate
net rate
Rates
log (labor)
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
0
2
4
6
8
10

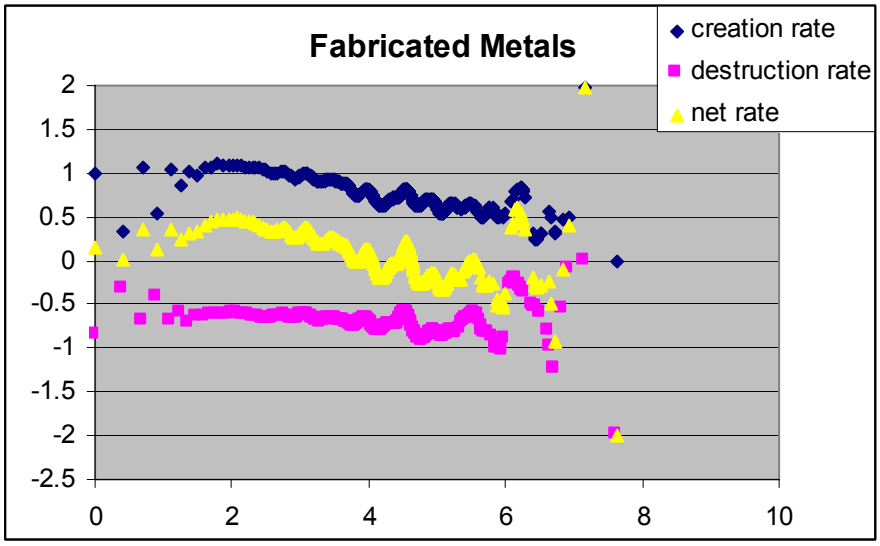

Clothing
creation rate
destruction rate
net rate
ln (labor)
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
0
2
4
6
8
10


Chemicals
creation rate
destruction rate
net rate
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
0
2
4
6
8
10
ln(labor)


Paper & Publishing
creation rate
destruction rate
net rate
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
0
2
4
6
8
10
ln(labor)


plastics
creation rate
destruction rate
net rate
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
0
2
4
6
8
10


iron & steel
creation rate
destruction rate
net rate
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
0
2
4
6
8
10
log(labor)


Fabricated Metals
creation rate
destruction rate
net rate
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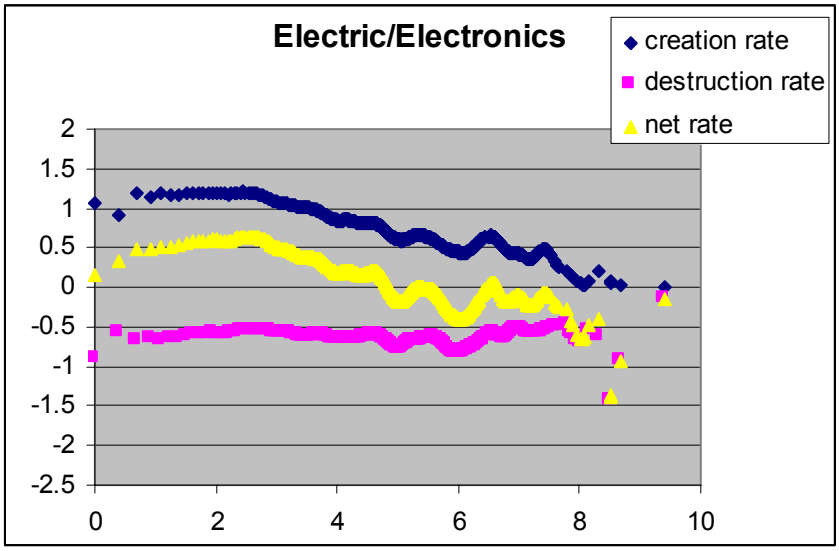
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
0
2
4
6
8
10


Electric/Electronics
creation rate
destruction rate
net rate
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
0
2
4
6
8
10