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A SELECTIVE SURVEY TO THE LITERATURE ON JOB CREATION AND DESTRUCTION*

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1. Introduction

Market economies are in a state of continuous turbulence. Each year, on the one hand, many businesses expand (and succeed), while, on the other hand, many others contract (and fail). Joseph A. *Schumpeter* (1942) called this process by the pithy expression "creative destruction". The view that recessions revitalize the economy was indeed prominent in pre-Keynesian economics[1] (see, for example, *De Long* 1990). It is fair to say that the reallocation and the reorganisation of resources culminates in the function of labour markets, where the reallocation of resources takes the form of gross job flows.

In particular, the creation and destruction of jobs require workers to switch employers and to shuffle between employment and joblessness. It is evident that the continuous reallocation of scarce resources is essential for the productivity of a market economy. On the other hand, as emphasized by *Hall* (1995, 1999b), the reallocation of resources in labour markets (for example, in terms of a layoff) can be painful for workers at the onset of a recession, because the loss of a regular job can lead to a whole sequence of low-pay interim jobs[2]. This feature is due to the empirical fact that the formation of new permanent employment relationship may take some time, because the quality of a new match will reveal itself only through the experimentation of both sides of a contract[3]. So, unemployed workers are in a state of reallocation.

Lilien (1982) provided an early empirical study that stressed the role of various sectoral shifts. The study included a highly controversial claim that most of the unemployment fluctuations of the seventies (unlike those of the sixties) were induced by unusual structural shifts within the U. S. economy (generated, for example, by a stream of oil price shocks). In contrast to the current literature on job creation and destruction, the empirical evidence about the role of reallocation presented by *Lilien* (1980) is based solely on the analysis of a simple

[1] During the Great Depression some policy makers held the view that even panic was not altogether a bad thing (*De Long* 1990, 6). Andrew Mellon argued: "It will purge the rottenness out of the system. High cost of living and high living will come down. People will work harder, live a more moral life. Values will be adjusted, and enterprising people will pick up the wrecks from less compenent people".

[2] In fact, *Mills, Pelloni* and *Zervoyianni* (1995) observe that a given amount of dispersion in U. S. employment growth across industries has been associated with more unemployment during downturns than upturns. On the other hand, *Davis* and *Haltiwanger* (1990) provide evidence for the view that allocative disturbances have a significant effect on unemployment within the U. S. manufacturing industry.

[3] *Gibbons* and *Katz* (1991) provide an elaboration of an asymmetric-information model of layoffs. When firms have discreation with respect to whom to lay off, the market infers that laid-off workers are of low ability. This means that the postdisplacement wages should be lower and postdisplacement spells should be longer for those displaced by layoffs than those displaced by plant closings.

macroeconomic time-series[4]. The study documented a strong, positive time-series relationship between aggregate unemployment and the cross-industry dispersion of employment growth rates as an indication of large-scale sectoral shifts[5].

The reorganisation view of labour markets is in sharp contrast with the traditional textbook model of labour markets that tends to assume that there exist representative firms and consumers that give rise to labour demand and supply. The driving forces of labour markets are various shocks. These include technology and policy shocks. So, high-frequence fluctuations in economywide output, productivity, and employment are typically modeled in an aggregate fashion that abstracts from sectoral and especially establishment-level heterogeneity and from frictions associated with reallocating resources across sectors and establishments (*Davis & Haltiwanger* 1990, 123). In particular, allocative shocks and resource reallocation process are typically associated with lower-frequence aggregate movements.

However, the traditional textbook picture of labour markets is not consistent with the key empirical regularities based on recent microeconometric studies. The availability of rich panel data sets has given rise to a new view that underlines the enormous heterogeneity and various frictions that characterize the actual function of labour markets[6]. *Bresnahan* and *Raff* (1992) provide an interesting example of heterogeneity in a historical study of the effect of the Great Depression on the American motor vehicle industry. In particular, there was the creation of new business and jobs taking place alongside a massive destruction process, and new plants with the massproduction system even entered the depths of the Great Depression. So, the downturn caused a major shakeout of the inefficient plants. In other words, the traditional empirical labour economics with a presentative agent framework takes into account only the first moments of distributions (e. g. means), but microeconometric studies have pointed out that the tails of distributions (for example, in the case of employment growth) are an essential part of the reallocation in the labour markets. It is a

[4] *Davis* and *Haltiwanger* (1999a) study the role of oil shocks by using establishment-level data. The results indicate that oil shocks account for about 20-25 percent of the cyclical variability in employment growth in the case of the U. S. manufacturing industry.

[5] *Abraham* and *Katz* (1986) questioned this interpretation. The fundamental problem of *Lilien's* (1980) dispersion index is that it does not directly measure the quantity of labour reallocation. So, the reported correlation alone cannot taken be as evidence for a causal role of sectoral shifts in the business cycle. There has been a large body of research to find better proxies for allocative shocks. For example, *Loungani, Rush* and *Tave* (1990) argue that dispersion in stock prices could be used to identify allocative shocks across sectors. In particular, they claim that the stock market dispersion index is less contaminated by aggregate demand influences than *Lilien's* (1980) employment dispersion index, because sectoral stock prices are likely to react to disturbances that are perceived to be permanent by nature, which need not be true of sectoral employment changes. *Davis* (1987a, 1987b) provides an elaboration of U. S. evidence. *Barlevy* (1999a) provides some new evidence for the reallocation hypothesis by using *Lilien's* (1980) approach.

fundamental fact of comparative advantage that the specialization of economic activity increases expected productivity. However, as a consequence of specialization, reallocation of resources also inherently involves substantial frictions[7] (see, for example, *Haltiwanger* 1997, 56). An obvious and important friction is that it is highly time- and resource-consuming for workers (and for other specialized inputs) to reallocate across production sites[8].

This paper is in three parts. The first section states the definitions and the basic empirical regularities of the microeconometric studies on job creation and destruction. It is highly important to note that these basic facts are almost exclusively based on the studies that use establishment-level data on the (U. S.) manufacturing sector. The second section briefly articulates some main established theories in the literature on job creation and destruction. However, the treatment of available theories on job creation and destruction is not a survey of a vast literature. The main focus of the treatment is in reallocation. The last section concludes.

[6] *Salter* (1960) is an early empirical study that focuses on vintage effects and heterogeneity in terms of productivity across firms.

[7] *Knight* (1951, 21) notes: "Specialization in itself, is an evil, measured by generally accepted human ideals. It gives us more products, but in its effects on human beings as such it is certainly bad in some respects and in others questionable".

[8] In particular, displacement creates the possibility of losses of job-specific or firm-specific human capital, and the risk of permanently lower wages for workers (*Kletzer* 1998). The various costs of reallocation are also evident in transition economies (see, for example, *Haltiwanger & Vodopivec* 1999; *Davis & Haltiwanger* 1999b, 36-43). *Blanchard* and *Kremer* (1997) has characterized the process of reallocation in transition economies as a "disruptive destruction" in contrast to creative destruction in the established market economies.

2. A look at the literature

2.1. Definitions

Davis, Haltiwanger and *Schuh* (1996) have proposed the standard ways of defining gross job flows[9]. In the terminology of job creation and destruction literature, a job is an employment position filled by a worker. The following measures are converted into rates by simply dividing by the average employment.

Definition 1. (Gross) Job creation (POS) at time t equals employment gains summed over all business units that expand or start up between t-1 and t.

Definition 2. Job destruction (NEG) at time t equals employment losses summed over all business units that contract or shut down between t-1 and t.

Definition 3. Employment change (NET) is the difference between gross job creation and destruction.

Definition 4. (Gross) job reallocation (SUM) at time t is the sum of all business unit employment gains and losses that occur between t-1 and t.

Definition 5. Excess job reallocation equals (gross) job reallocation minus the absolute value of the net employment change. This means that excess job reallocation is an index of simultaneous job creation and destruction.

Definition 6. (Gross) worker reallocation at time t equals the number of persons who change their place of employment or employment status between t-1 and t.

The different forces affecting net employment changes across sectors and the basics in the identification of a reallocation shock can be illustrated with a simple diagram (*Baldwin, Dunne & Haltiwanger* 1998, 349). Fig. 1A depicts the long-run steady state in an economy with two sectors (IND 1 and IND 2). Sector 1 is a low reallocation sector. On the other hand, sector 2 is a high reallocation sector. Fig. 1B illustrates an intermediate-run steady state, where in the aggregate job creation equals job destruction. So, the net employment change is zero in this case. Fig. 1C depicts the impact of an adverse aggregate shock starting from the steady

[9] These definitions have not always been universally applied. In fact, *Blanchard* and *Diamond* (1990) measured job creation as the sum of employment gains at new and expanding establishments *plus* an estimate of the change in outstanding vacancies. However, the measures of job creation by *Blanchard* and *Diamond* (1990), and by *Davis, Haltiwanger* and *Schuh* (1996) deliver almost identical results in the case of the U. S. manufacturing sector.

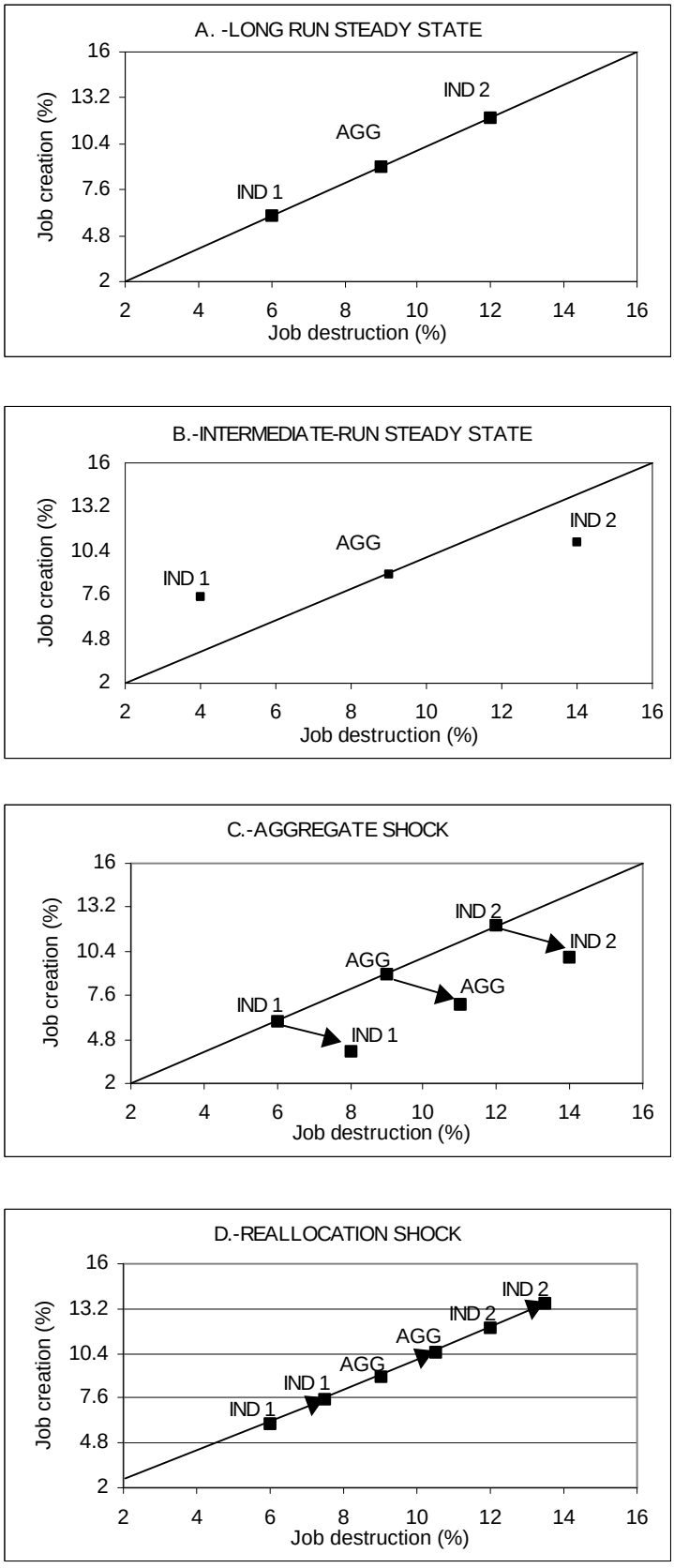
state depicted in Fig. 1A. The adverse aggregate shock causes job destruction to rise and job creation to fall in both sectors. Fig. 1D is an illustration of a reallocation shock. The key fact is that a reallocation shock delivers an increase both in job creation and destruction. In contrast, a pure aggregate shock delivers asymmetric movement in job creation or destruction. These patterns help to identify allocative and aggregate shocks.

The measures of gross job flows are usually calculated by using establishment-level data. This is due to the fact that firm-level data mask the job flows between establishments of the same firm. Also, accurate longitudinal linkages are more difficult to achieve with firm-level data, because of sometimes complicated changes in the ownership and organisation of firms (such as mergers and divestitures). In addition, large complex firms have many establishments distributed across geographic locations and industries and thus measuring employment change at the establishment is essential to understand the variation in growth rates by region or industry (*Haltiwanger & Krizan* 1999, 95). As a counterargument for the frequent use of establishment-level procedure, some have claimed that, in fact, a firm is an economic and legal entity that is particularly important in terms of financial considerations[10]. So, according to this view, job creation and destruction measures should be calculated by using firm-level panel data. It is important to note that the calculations based on establishment-level data typically record, for example, no job creation and destruction associated with the replacement of secretaries by programmers.

So, the concepts of job creation and destruction decompose net employment changes into gross job flows and therefor facilitate a detailed characterization of establishment-level employment dynamics. In other words, job creation and destruction figures decompose the net employment change into a component associated with growing plants and a component associated with shrinking plants (*Davis, Haltiwanger* and *Schuh* 1996, 11). For example, suppose that aggregate employment grew 2 percent during the past year. That growth rate could be supported by 4 percent job creation and 2 percent job destruction rates, or by 22 percent creation and 20 percent destruction rates. *Davis* and *Haltiwanger* (1990, 124) note that the major advantage of the focus on gross job reallocation as opposed to gross worker flows is that, for example, previous U. S. studies have documented the tremendous gross worker flows across labour states (i. e., employment, unemployment, out of the labour force) and high worker turnover rates. However, in the absence of evidence from longtudial

[10] In particular, *Fazzari, Hubbard* and *Petersen* (1988) provide an empirical evidence for the view that internal finance is important for the investment behaviour of firms. *Rantala* (1999, 39-46) provides a brief summary of the literature.

Figure 1. An illustration of an aggregate shock and a reallocation shock with a two-sector economy (Source: *Balwin, Davis* and *Haltiwanger* 1998, 349).



establishment-level data, it has been difficult to determine whether large gross worker flows primarily reflect temporary layoffs and recalls plus continual sorting and resorting of worker across a given set of jobs or, alternatively, whether a large portion of worker turnover is driven by gross job destruction and creation.

2.2. Basic facts

It is highly important to note that due to the data limitations, virtually all of the key empirical findings refer to the (U. S.) manufacturing sector[11]. The first basic fact concern the magnitude of gross job flows. It has become clear that the gross flows are large relative to net employment change. The pace of job creation and destruction is rapid. For example, using annual data, roughly 1 in 10 jobs are created and another 1 in 10 are destroyed each year in the U. S. manufacturing sector. Also, job reallocation is a large part of total worker reallocation. These two findings are also observed in a number of other countries[12] (see, *Davis* and *Haltiwanger* 1999b, 8-9).

The second basic fact is the dominant role of plant-specific and firm-specific factors in accounting for the largely observed magnitudes of gross job flows (see, for example, *Haltiwanger* 1997). The predominance of idiosyncratic factors is an implication of the fact that most of the excess reallocation is within narrowly defined sectors. For example, employment shifts among approximately 450 four-digit industries in the U. S. manufacturing sector account for a mere 13 percent of excess job reallocations (*Davis* and *Haltiwanger* 1999b, 9-10). So, the overwhelming bulk of time variation in gross job reallocation is accounted for by time variation in the idiosyncratic component (*Davis & Haltiwanger* 1990, 125). This observation implies that job flows are largely driven by plant-level and firm-level heterogeneity in labour demand changes and not by economy wide disturbances with differential sectoral effects (*Davis* and *Haltiwanger* 1992). The other important implication of the predominance of idiosyncratic factors is that the assumption of a representative firm or an establishment is not reasonable even at the level of a detailed industry. Similar patterns

[11] *Davis* and *Haltiwanger* (1990), and *Davis, Haltiwanger* and *Schuh* (1996), and *Davis & Haltiwanger* (1999b) provide a list of basic facts of the literature with additional references.

[12] For example, *Salvanes* (1995) provides Norwegian evidence on job creation and destruction. The job turnover appears to be similar to the levels found in other OECD countries. Den *Butter* and *Van Dijk* (1998) provide evidence that net changes in labour market stocks are small relative to the gross flows in the case of The Netherlands.

hold for many other market economies. So, the predominance of idiosyncratic factors is an indication of heterogeneity in a contrast to the framework of a presentative firm[13].

The third fact is that most of the reallocation reflects the persistence of underlying employment changes[14]. To the extent that plant-level employment changes are persistent, they must be associated with long-term joblessness or worker reallocation across plants. *Davis, Haltiwanger* and *Schuh* (1996) report that about 20 for % of job destruction and 15 for % of job creation is accounted for by the entry and exit of firms in the case of the U. S. manufacturing sector. For 5-year changes, *Baldwin, Dunne* and *Haltiwanger* (1995) report that about 40 for % of creation and destruction are accounted for by entry and exit, respectively.

The fourth basic fact is the concentration and lumpiness of underlying employment movements. In particular, many studies find that births and deaths account for large fractions of job creation and destruction. Births and deaths are simply the extremes of an underlying growth-rate distribution. Thus, reallocation is dominated by large changes[15] (the entry and exit of firms). The theme of nonlinear microadjustment is developed in the adjustment cost literature[16]. A large quantity of births and deaths indicates that usually assumed convex adjustment costs are not relevant at the plant-level[17]. In fact, microeconometric evidence suggests that the adjustment of labour and capital is “lumpy” at the plant-level. For example, in the U. S. manufacturing industry gross job flows are concentrated in a relatively small number of plants that experience high rates of expansion and contraction[18] (*Caballero, Engel* and *Haltiwanger* 1997). So, the distribution of establishment-level employment changes

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[13] There are also a number of theories on the heterogeneity of firms’ outcomes. *Foster, Haltiwanger* and *Krizan* (1998), and *Davis & Haltiwanger* (1999b) provide surveys of these theories. Some theories focus on the uncertainty of new products and experimentation. On the other hand, theories such as *Lucas’s* (1978) stress that it is the managerial ability that eventually determines the failure or the success of a firm.

[14] The persistence of job creation (and destruction) is defined as follows: the N-period persistence of job creation (job destruction) is the percentage of newly created (destroyed) jobs at time t that remain filled (that do not reappear) at each subsequent sampling date through time t + N (see, for example, *Davis* and *Haltiwanger* 1999b, 10).

[15] The process of the entry and exit of firms can also be characterized by information cascades with various bandwagon effects. This feature may explain a part of the recent entry of Internet companies. *Caplin* and *Leahy* (1998) provide a model on these issues.

[16] *Hamermesh* and *Pfann* (1997) provide a survey of the adjustment cost literature.

[17] In fact, *Foster* (1999) observes that employment adjustments vary systematically by establishment characteristics. Employment adjusment behaviour also shows substantial inertia in the face of large employment surpluses.

[18] In an interesting empirical study using French establishment-level data, *Abowd, Corbel* and *Kramarz* (1999) conclude that the adjustment of employment is made primarily by reducing hires, not by changing the separation rates.

exhibits both considerable heterogeneity and fat tails (*Haltiwanger* 1997). The adjustment costs can arise from the lost of output incurred when reorganizing a plant's production process to operate at a larger or smaller scale. For example, using Dutch data, *Hamermesh*, *Hassink* and *Van Ours* (1994) found that many firms kept the total number of jobs constant over a two year period but no firm kept the identity of its employees constant. This is a clear sign of reorganization. From a regional point of view, a high concentration of job creation and destruction may accentuate negative feedback effects on local economies[19].

The fifth basic fact is about the distinct cyclicality of job creation and destruction. At least, in the case of U. S. manufacturing, a noteworthy feature of plant-level data is the relatively volatile nature of job destruction. In particular, job destruction is more responsive to changes in activity than is the rate of job creation (see, for example, *Hall* 1999b). The results reported by *Davis* and *Haltiwanger* (1992) show that the large variance of job destruction relative to that of job creation is mostly the result of the behaviour of old, large, multi-unit establishments in the case of the U. S. manufacturing sector. In particular, a number of theories on job creation and destruction try to explain the more volatile nature of job destruction relative to job creation. In an important paper, *Footie* (1998) argues that the relatively more volatile nature of job destruction is not a regularity in the non-manufacturing industries. In particular, the study links the relative standard deviations of creation and destruction in an industry to the relative means of an industry's gross job flows. However, the empirical part of the study uses annual data only from a set of Michigan industries. The empirical observation that the relative variance of job destruction declines sharply with an industry's trend employment growth rate can be explained with a mechanical (S, s) model with a fixed set of employers[20]. The basic idea is that a negative (positive) employment trend leads the cross-sectional density of deviations from desired employment to bunch near the destruction (creation) boundary, so that job destruction (creation) is more responsive to common shocks. There are also a number of measurement issues. *Boeri* (1996) argues that the asymmetry in the cyclical behaviour of gross job flows can be attributed to statistical artifacts, namely, with the fact that U. S. job turnover statistics underrepresent the small business sector and regression to the mean effects. The available sample period of the panel

[19] *Ramey* and *Shapiro* (1998) provide a number of interesting case studies on the fact that reallocation can be very costly to the local economy. For example, they find by using auction values that in the case of the closure of a Californian aerospace plant, the equipment resale prices averaged only 35 percent of net-of-depreciation purchase values.

[20] *Bar-Ilan* and *Blinder* (1988), *Bertola* and *Cabarello* (1990), *Cabarello* (1991), *Cabarello* and *Engel* (1991, 1994) provide (S, s) models.

data sets for many European countries is quite short, which means that a definite conclusion about relative volatility on job creation and destruction is hard to reach[21].

The sixth fact is that there are systematic differences by plant characteristics. In particular, the excess reallocation rate decreases in the size and age of the firm in the case of U. S. manufacturing sector[22]. *Davis* and *Haltiwanger* (1999b, 18-20) show that the empirical observation that the excess reallocation rate is decreasing in the size of a firm is not derived from the notion that large establishments are random collections of smaller establishments. Also, the age effects are more pronounced among smaller plants. The size effect of reallocation rates can be explained, at least partly, by the fact that large firms can smooth out the idiosyncratic disturbances that hit smaller units[23]. This conclusion is consistent with the other observation that the pace of job reallocation is substantially higher among completely specialized plants than more diversified plants[24] (*Davis* and *Haltiwanger* 1999b). The magnitude of gross job flows also declines with average plant wages. The observation can be explained by the fact that specific human capital strengthens the durability of the employment relationship in the face of various disturbances. The systematic differences by plant characteristics are also found in a number of other studies. For example, *Nocke* (1994) has found basically the same patterns of size and age in terms of excess reallocation for French job flows. However, *Haltiwanger* and *Krizan* (1999, 93) stress that the dominance of idiosyncratic factors serves as an important caution for attributing net growth to plants classified by any observable plant characteristic.

2.3. Some theories of job creation and destruction

[21] *However, Bingley, Eriksson, Westergård-Nielsen* and *Werwatz* (1999) observe that the conclusion that job reallocation is countercyclical is fragile in the case of the Danish evidence. The conventional measures of job creation and destruction do not distinguish among part-time, full-time, and overtime employment positions – all count equally as a single job (*Davis, Haltiwanger* and *Schuh* 1996, 9). *Arai* and *Heyman* (1999) use Swedish quarterly data on establishment-level hires and separations to analyse the dynamics of permanent and temporary contracts. The results indicate that job and worker flow rates for temporary contracts are at least 10 times higher than those for permanent contracts. This means that the aggregate measures of job creation and destruction based on all types of contracts are dominated by the high turnover of temporary employment.

[22] This particular observation is consistent with a key stylized fact in the industrial organisation literature (*Caves* 1998), which states that the variance of growth rates in employment, sales or some other key measures of economic activity tend to decline with the size of a firm. So, various learning and selection mechanisms among firms seem to be an important element of reallocation. In particular, learning by doing and uncertainty can lead to new businesses having an incentive to start small before expanding.

[23] There has been a public debate about the role of small business in job creation. *Haltiwanger* and *Krizan* (1999) conclude that in the case of U. S. manufacturing, for employment growth, it looks as if the more important factor is age and not size. Put differently, most small establishments are new and young establishments. Thus, the role of small business in job creation may simply reflect the role of births and in turn young establishments.

[24] *Jovanovic* (1993) argues that the degree of diversification by U. S. firms has increased during the past few decades. The main reason for this feature is the secular increase in the capital-labor ratio.

There are a number of theories on job reallocation[25]. These models tend to include two fundamental insights (*Davis* and *Haltiwanger* 1999b, 44). Most theories that incorporate job and worker flows adopt the premise that the economy is subject to a continuous stream of allocative shocks – shocks that cause idiosyncratic variation in profitability among job sites and worker-job matches. Idiosyncratic effects can operate, for example, via vintages of technology. Various theories also emphasize moving costs, search costs, sunk investments and other frictions that impede or otherwise distort the free allocation of factor inputs. These two fundamental elements give rise to an essential role for the allocative process[26].

Black (1995, 174-176) has noted that one can analyse allocative shocks as events that alter the closeness of the match between the desired and actual characteristics of labour and capital inputs at the plant-level. This means that the stream of allocative shocks often sharply devalues capital (physical and human) specific to that pattern of production (*Davis* and *Haltiwanger* 1999b). For example, the OPEC oil price shock of 1973 increased the demand for small, fuel-efficient cars and simultaneusly reduced the demand for larger cars. So, capacity utilization and output fell in American automobile companies, because they were poorly situated to respond to a rise in the crude oil price.

Davis and *Haltiwanger* (1990) have presented the elementary reallocation timing model. There are two types of production sites. The basic assumption of the model is that there is a consumption loss from a shutdown of a low productivity plant, because it takes one period for workers to reallocate from a low productivity plant to a high productivity plant[27]. This means that unemployment in the model is a direct consequence of employment reallocation. As the economy moves through time, some high-productivity sites become less productive, while new ones are created from time inputs. The timing of worker and job reallocation is endogenous in the model. The basic implication of the reallocation timing model is that the pace of reallocation is highest in a recession. This feature is due to the fact that in a

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[25] An opposite view is articulated in the real business cycle literature, which typically assumes that there are no mobility costs and no heterogeneity of agents (see, for example, *Davis* and *Haltiwanger* 1999b, 43-44).

[26] *Davis* and *Haltiwanger* (1999b, 48-49) discuss the evidence about the role allocative shocks. According to *Campbell* and *Kuttner* (1996) reallocation shocks account for over half of the variance in total U. S. employment fluctuations. *Davis* and *Haltiwanger* (1999c) provide also an interesting study with U. S. data, because as a frequent critique of various proxy variables for allocative shocks the study uses vector autoregressive models, instead. The main conclusion with vector autoregressive models is that it is hard to account for post-war fluctuations in job creation and destruction without assuming a role for some kind of allocative shocks. So, there must be a time-varying reallocation component in the quarterly series of job creation and destruction.

[27] In an earlier elaboration of the sectoral-shifts hypothesis, *Davis* (1987a, 353-367) underlines that the unemployment changes induced by allocative shocks can be influenced by past patterns of labour reallocation. In particular, an allocative shock unfavourable to the current allocation of labour would reinforce past patterns of labour reallocation of labour intensity skill, location and informational mismatches between employers and employees. A favourable shock would, instead, have an opposite mitigating impact and it is thus reasonable to expect that an unfavourable disturbance would increase unemployment relatively more than a favourable one.

recession the opportunity cost (e. g. the value of lost output) of reallocation is much lower than in a boom[28]. In fact, the optimal reallocation policy equates the marginal utility loss associated with forgone current output to the discounted expected marginal utility gain associated with an improved future employment allocation. The fundamental tradeoff in the model is that a drop in present consumption due to reallocation activity delivers a rise in future consumption. In other words, in a recession, it is more valuable to invest in reallocation, which is an essential part of solid long-term growth[29]. So, the structural change in the economy will be greater during recessions. In terms of gross job flows, recessions are times of large job destruction and a mild decline in job creation[30]. This means that the main implication of the reallocation timing model is in line with the earlier stylized fact that job destruction is more responsive to changes in activity than is the rate of job creation[31].

A model on job creation and destruction by *Mortensen* and *Pissarides* (1994) indicates that aggregate shocks will strongly affect reallocation. The model assumes that new jobs are more productive than existing ones. So, the model includes firms' heterogeneity. The friction of the model is that it is costly to fill new jobs. However, the choice of technology is fully flexible before creation. The rate at which vacant jobs and unemployed workers meet is determined by a simple matching function. Firms and workers try to maximise the total match surplus. Firms have the option of closing jobs at no cost; a filled job continues in operation for as long as its value is above zero. In this asset pricing framework, adverse shocks will yield a spike in job destruction that is not matched by a fall in creation. However, unemployment is not a jump variable. Firms want to reallocate workers across employment opportunities or engage in nonproduction activities (such as the search for a new match) during the times

[28] The reallocation timing model assumes that there are only two activities (work and reallocation). So, there is no "fun" (e. g. leisure) in the model. An option of leisure would mean that a part of the time invested in reallocation in a recession would be consumed as a leisure through traditional intertemporal substitution effects (*Lucas* and *Rapping* 1970). On the other hand, the persistence of shocks would yield an option value effect. In fact, the pace of reallocation would decline in this case, because the persistence of shocks would imply that a plant could vanish without active reallocation of resources. Thinking beyond the model, the basic insight of the approach claims that recessions are times when activities (such as education), which facilitate reallocation are taken in order to preserve the long-term growth.

[29] A study by *Gourinchas* (1999) is an interesting elaboration of allocative shocks in the context of an open economy. The basic finding in the case of U. S. manufacturing is that real exchange rates have a significant effect on gross and net job flows in traded goods sector. In particular, job creation and destruction comove positively, following a real exchange rate shock. As defined earlier, the comovement of job creation and destruction is an indication of a reallocation shock.

[30] This observation is consistent with the notion by *Blanchard* and *Diamond* (1990) that most of the burden of adjustment is carried, in a recession, by the rise of unemployment, not by decline in vacancies.

[31] In an interesting study, *Dannebaum* (1999) does not find support to the hypothesis that recessions are times when repressed structural changes take place in the case West German manufacturing industry.

when aggregate production declines[32]. As in the case of the model by *Davis* and *Haltiwanger* (1990), this key implication of the model (that job destruction is more volatile than job creation) is in line with the earlier stylized fact. In fact, numerical simulations indicate that model can replicate the cyclicality of job creation and destruction in the case of the U. S. manufacturing sector with quarterly data.

Caballero and *Hammour* (1994) present a vintage/growth model on the cleansing effects of recessions that is related to an earlier "pit-stop" view of recessions presented by Davis and *Haltiwanger* (1990), according to which recessions are times when productivity-improving activities are undertaken because of their temporarily low opportunity costs. *Caballero* and *Hammour* (1994) argue that reallocation via the entry and exit of firms is essential for growth[33]. The basic starting point of the model is that the newest technology can be obtained only by creating new jobs, and the adoption of superior new technology requires the destruction of old relationships. Under this view cyclical variation in job creation and destruction is tightly linked to technological advance and obsolescence and disconnected from incentives to vary utilization of existing capacity. The model assumes the free entry of production units and perfect foresight. As long as creation takes place, free entry equates a unit's creation cost to the present discounted value of profits over its lifetime. An important element of the model is that it includes a possibility of an "isulation effect", which refers to a situation where the cost of job creation is assumed to be a constant. So, demand fluctuations are accommodated exclusively on the creation margin, and the destruction rate of existing production units does not respond to demand fluctuation at all. The explanation for this feature of the model is that in a recession the cost of entry also declines, which stimulates the build-up of new production units. However, in reality, the industry will not be able to create all the necessary production units instantaneously in response to a rise in demand. Thus, the conclusion of the model is that recessions are a time of "cleasing" when outdated

[32] *Campbell* and *Fisher* (1996) provide a simple explanation for the observation that the variance job destruction is greater than the variance of job creation without assuming job search and matching frictions, incomplete contracts or aggregate congestion effects. In their model profit maximization in the presence of proportional plant-level costs of job creation and destruction implies that shrinking plants are more sensitive than growing plants to aggregate shocks.

[33] *Baily, Hulten*, and *Campbell* (1992), and *Foster, Haltiwanger* and *Krizan* (1998) provide a summary of the available empirical evidence that reallocation is good for the productivity of industries. In particular, the role of entry and exit is an essential part of the reallocation. The basic result is that 60 percent of the 10-year increase in multifactor productivity for the average U. S. manufacturing industry is accounted for by effects that involve the reallocation of output across production sites. However, it is inappropriate to infer that all or even most job reallocation reflects the movement of employment from less productive to more productive sites. In fact, *Baily*, *Rartelsman* and *Haltiwanger* (1996) find that continuing plants in the U. S. steel industry experienced substantial productivity gains while downsizing. In an interesting study, *Farber* and *Hallock* (1999) observed that the overall stock market reaction to the announcements of job loss, which has always been small (less than 1 percent), is most negative earlier in the sample during the 1970-1997 period and has become less so over time. This observation is consistent with the fact that downsizing can indeed deliver substantial productivity gains. *Van der Wiel* (1999) provides controversial evidence on the role entry and exit in the case of Dutch business services. The results indicate that entering firms are equally as productive as exiting firms.

or unprofitable techniques are pruned out of the production system. Stifling reallocation also stifles long-term growth.

A version of the vintage model can be used to illustrate the benefits of reallocation activity. In fact, *Davis* and *Haltiwanger* (1999) provide a model with specific capital that indicates that the shutdown of reallocation (e. g. the process of gross job flows) immediately produces a consumption-led business cycle boom. Numerical experiment gives the result that consumption rises by 20 percent in the intervention period and remains above the pre-intervention level for two years as workers shift from reallocation to production activities and the volume of specific investments declines. Unemployment and job reallocation decline to zero. These highly favorable short-term macroeconomic effects may explain the support for various restrictions among policy makers[34]. Of course, the shutdown of reallocation causes large welfare losses from a long-run perspective as the steady state growth rate gradually shifts downwards[35].

The ealier models assume that the adoption of new technology requires an entry of a new firm and the destruction of old relationship. As casual observation confirms, the adoption of technology does not necessarily require the build-up of a new plant. *Cooper, Haltiwanger* and *Power* (1999) study another class of vintage models in a dynamic stochastic environment. The model emphasizes that existing plants can adopt new technology by retooling. The retooling process may generate within-plant and between-plant job reallocation. For example, retooling to adopt a skill-biased technological improvement can bring changes to both the level and skill mix of the plant's work force. The costs of retooling depend on the nature of adjustment cost specification: lump sum versus proportional costs. This means that recessions are not always the optimal time to retool. In particular, replacement investment is more likely to be procyclical the more persistent are shocks and the more important are fixed adjustment costs.

Caballero and *Hammour* (1996) have studied more about the normative side of reallocation in their model of timing and efficiency of creative destruction. The model assumes that an

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[34] Restrictions could also provide a second-best risk-sharing device. *Davis* and *Willen* (1999) have studied the correlation between earnings shocks and asset returns. According to the results, the correlation between returns on the S&P 500 and earnings shocks exceeds 0.4 for older, college-educated women, ranges from 0.1 to 0.3 over most of the life cycle for college-educated men and is roughly -0.25 for men who did not finish high school. So, trade in a broad-based equity index enables individuals to hedge only a small portion of group-level earnings risk.

[35] *Hopenhayn* and *Rogerson* (1993) provide another analysis of policies that interfere the process of reallocation. In particular, the results indicate that a tax on job destruction at the firm level has a sizable negative impact on total employment. For example, a tax equal to 1 year's wages reduces employment by rougly 2.5 percent. The cost in terms of consumption of this same tax is greater than 2 percent. The mechanism through which this welfare loss arises is a decrease in average productivity.

exogenous technical progress is embodied in production units and drives the continuous process of their creation and destruction. The basic insight of the model is that the sunkness of investment in new capital implies potential ex post hold-up problems within relationships that can lead to an inefficient situation from a macroeconomic perspective, where job creation and destruction decouple and the pace of job destruction is too intensive during recessions from a social point of view[36]. The problem arises owing to the fact that the sunk costs of firms and the search costs carried by workers are not part of the maximization of the joint surplus of the economy. For example, a binding complete contract cannot be written and enforced before specific investment is sunk and the resulting site-specific quasi rents are potentially appropriable by the workers. In particular, transactional difficulties distort intertemporal substitution that leads to technological "sclerosis", characterized by excessively slow renovation and "quantity" movements in hiring. An efficient restructuring of the economy involves synchronized job creation and destruction and produces relatively little unemployment. The only beneficial function unemployment plays in an efficient economy is to reduce the search costs of creation. Unemployment thus acts as an equilibrium response of the inefficient economic system that restrains the bargaining position of insiders and preserves the profitability of investment. Empirical evidence is consistent with the decoupling hypothesis. In other words, a rise in job destruction in a recession does not produce an equal rise in job creation and as a consequence of this, unemployment soars[37].

A search model by *Ramey* and *Watson* (1997) focuses on contractual fragility. The argument is of the model that the earlier "reorganisation" view of job creation and destruction is not in line with empirical regularities[38]. In particular, recessions do not appear to be good times for job losers. Workers and firms are engaged in a dynamic version of the prisoner's dilemma. The basic insight of the model is that job loss results from the fragility of incentives within the relationships, as opposed to the attractiveness of opportunities outside of the relationship[39].

[36] *Malcomson* (1998) provides a survey on hold-up problems in the context of labour markets. As an interesting collary *Caballero* and *Hammour* (1996) show that a downward-sloping Beveridge curve is associated with the decoupling of creation and destruction in an inefficient economy with appropriable specific quasi rents. *Layard, Nickell* and *Jackman* (1991) argue that a downward-sloping Beveridge curve is indeed a regularity in OECD countries. So, the model by *Caballero* and *Hammour* (1996) can replicate this stylized fact.

[37] *Cabarello* and *Hammour* (1999) provide another model on job creation and destruction. In contrast to an earlier view, they claim that recessions, in fact, result in reduced restructuring, and that is likely to be socially costly once inefficiencies on both the creation and destruction margins are considered.

[38] In fact, *Ramey* and *Ramey* (1997) argue that the empirical evidence supports the view that the high volatility of growth is harmful for the long-term average growth. *Caballero* (1999) provides an interesting discussion on these issues in the context of Argentina.

[39] *Hall* (1998) argues that a jump in the expected real interest rate results in an immediate spike of inefficient job destruction and inventory liquidation, followed by a declining pattern of additional destruction. *Garibaldi* (1997) concludes that net employment change responds more to an increase in interest rate than to an easing of monetary policy.

Inefficient separation, despite a renegotiation option, is a consequence of the fact that it is difficult to maintain cooperative behaviour (high effort) in bad states of the world.

The models on job creation and destruction typically assume perfect capital markets in order to facilitate the reallocation of resources. *Barlevy* (1999b) provides another model that is a critique of the reorganisation view of job creation and destruction. The model shows that when credit market frictions are introduced, the result that recessions are times of cleansing can be reversed[40]. That is, the most efficient jobs are, in fact, destroyed in recessions, resources are allocated towards less productive uses, and misallocation is exacerbated.

[40] *Barlevy* (1999c) has modified the search model in order to deliver the same conclusion. In particular, the paper argues that recessions hamper the ability of workers to search on the job and move into better matches; as a result, fewer good matches are created in recessions, even as the worst jobs at the bottom are cleansed. *Barlevy* (1999d) provides some empirical evidence for the view that workers appear to move to less productive jobs during recessions.

3. Concluding remarks

The concepts of job creation and destruction decompose net employment changes into gross job flows and therefore facilitate a detailed characterization of establishment-level employment dynamics. However, the basic empirical regularities of the literature are almost exclusively derived from the studies that use establishment-level data from the manufacturing sector. Forthcoming studies will show the validity of these regularities in the other sectors of the economy. There is some evidence that at least the more volatile nature of job destruction is not present in non-manufacturing sectors. This is an interesting observation, because a number of theories on job creation and destruction try to explain the more volatile nature of job destruction relative to job creation.

There are two main categories of theoretical models on job creation and destruction. One category of theories (e. g. *Davis* and *Haltiwanger* 1990; *Mortensen* and *Pissades* 1994; *Cabarello* and *Hammour* 1994; 1996) argue that reallocation is an essential part of the long-term growth of market economies. This reorganisation view of reallocation stresses the basic insight that reallocation is a cure for the inefficiencies of old vintages of technologies. The other, emerging category of theories on job creation and destruction (e. g. *Ramey* and *Watson* 1997; *Barlevy* 1999) argue, in contrast to the earlier theories, that the high pace of reallocation in a recession is, in fact, an inefficiency. These theories focus on contractual fragility and credit market imperfections. Thus, the most productive jobs can vanish in recessions. In a way, this divide in the theoretical literature on job creation and destruction can be reduced to the old, pre-Keynesian debate about the very nature of recessions: “Does a recession revitalize a market economy?”.

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