Small Business and Job Creation: A Comment

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ABSTRACT. Davis, Haltiwanger and Schuh (1996) claim to dissect the myth and reassess the facts on the job creation prowess of small businesses. We disagree with the authors. In this comment we discuss their five chief findings and conclusions and in particular, the use of a "regression-to-the-mean" correction.

1. Introduction

Davis, Haltiwanger and Schuh (1996) claim to dissect the myth and reassess the facts on the job creation prowess of small businesses. They present five chief findings and conclusions. These are as follows:

1. Conventional wisdom about the job-creating prowess of small businesses rests on misleading interpretations of the data;
2. Many previous studies of the job creation process rely upon data that are not suitable for drawing inferences about the relationship between employer size and job creation;
3. Large plants and firms account for most newly-created and newly-destroyed manufacturing jobs;
4. Survival rates for new and existing manufacturing jobs increase sharply with employer size;
5. Smaller manufacturing firms and plants exhibit sharply higher *gross* rates of job creation but not higher *net* rates.

We disagree with the authors that the five findings and conclusions given above dissect any myth or reassess any fact. In the remainder of this comment we will amplify our view. Moreover, we shed some new light on the regression fallacy.

2. So-called conventional wisdom and misleading interpretations

In their first section Davis *et al.* report that the conventional wisdom is that small businesses are the fountainhead of job creation. As an illustration they present some examples. These examples, however, are mainly drawn from newspapers or from speeches by politicians. We suggest that the "conventional wisdom" is not taken for granted in the academic literature. We evaluate the three misleading interpretations of the data mentioned by Davis *et al.*, i.e., the *size distribution fallacy*, the *"regression-to-the-mean" bias* or *regression fallacy* and the *confusion between net and gross creation*.

2.1. *Size distribution fallacy*

Davis *et al.* are right that changes in the size distribution of employment form an unsuitable basis to draw conclusions about the relationship between job creation and (individual) employer size. Especially, in a period of downsizing – which occurred in the 70s and 80s – firms move relatively frequent downwards in the size distribution, leading to an observed increase of the share of SMEs. However, Davis *et al.* do not cite academic studies which trap into the size distribution fallacy. Moreover, Klomp and Thurik (1994) – in their review of empirical studies in the growth-size literature – do not find such studies.

2.2. *Regression fallacy*

We now turn to the regression fallacy. The interpretation of this fallacy in the (employment)

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growth-size relationship is that large firms may be large because of a stochastic, transitory increase in employment. Because this increase is temporary, firms that are large in a certain period are (on average) likely to decrease in the next period. The reverse holds for small firms. The observation that – measured from the base-year or initial period – small firms show on average higher growth rates than large ones is then the regression fallacy. This observation in favour of small firms is, however, only caused by stochastic, temporal shocks in employment. Davis *et al.* make a plea to use the average size – as the independent variable – in the growth-size relationship to avoid the "regression-to-the-mean" bias.

In their section 7 Davis *et al.* suggest that longitudinal studies of the relationship between growth and (employer) size which are corrected for the regression fallacy should be preferred above those which are not. We disagree with this general suggestion. Davis *et al.* suggest that firms fluctuate around their own long run size. We doubt whether the concept of a long run size is useful. First, firms are continuously confronted with environmental changes. Such changes conflict with a long run firm size which has to remain constant over time.[1] Second, for young firms – which are generally small because firms enter the market at small sizes[2] – it may be quite impossible to give a proper definition of its long run size. Especially, young and small firms will – if they survive – grow faster than their old and large counterparts.[3]

Table I provides an illustration of a case for which we believe that a correction for the "regression-to-the-mean" bias is inadequate.[4] The conclusion from this table seems to be clear. Firm 1 grows, employment in firm 2 is stable and firm 3 declines. If we regress the (logarithmic) growth for the entire period on initial size then we would find – in accordance with Table I – a negative regression coefficient. However, if we replace initial size by average size there would be no relation between growth and size at all.

TABLE I
Illustration of an undesirable effect of the correction for regression fallacy

	Firm 1	Firm 2	Firm 3
Year 1 employment	400	500	600
Year 2 employment	500	500	500
Year 3 employment	600	500	400
Year 2 logarithmic growth	0.223	0	–0.182
Year 3 logarithmic growth	0.182	0	–0.223
Logarithmic growth in the entire period	0.405	0	–0.405
Initial size	400	500	600
Average size	500	500	500

The main difference between Table I and box 4 in Davis *et al.* is that in our table firms show a *persistent* growth or decline, while the firms in box 4 show *temporary changes* in the level of employment. We believe that allowing for the possibility for – at least some – firms to grow persistently is the key element for the decision whether or not to correct for the "regression-to-the-mean" bias. With the difference between persistent or temporal growth rates in mind, we observe that in the literature two "schools" may be identified in the formulation of the growth-size model. Adherents of the first school – which support the assumption that firms fluctuate around their own long run size and that deviations from this size are temporal – are for instance Davis *et al.* and Leonard. The analysis in Leonard (1986) starts with equation (1):

$$\ln S_{i,t} = X_i\beta + \varepsilon_{i,t} \tag{1}$$

where $S_{i,t}$ is the size of firm i in period t, X_i is the vector of firm characteristics given optimal scale, i.e., a vector of time-invariant firm characteristics and $\varepsilon_{i,t}$ is a random error that may include measurement error and $\varepsilon_{i,t} \overset{i.i.d.}{\sim} N(0, \sigma_\varepsilon^2)$.[5]

The expected growth conditional on initial size ($\ln S_{i,t-1}$) equals $-\varepsilon_{i,t-1}$. Thus, compared to their expected sizes, large firms are expected to shrink and small firms are expected to grow. A regression of firm growth rates on initial firm sizes will therefore suffer from the "regression-to-the-mean" bias. Adherents of the first school assume *firm size* to fluctuate randomly around the expected value of $X_i\beta$ in equation (1). Followers of the second school analyze whether the *firm growth rates* fluctuate randomly, i.e., whether Gibrat's law is valid. In Evans (1987b) the following regression framework is presented:

$$(\ln S_{i,t} - \ln S_{i,t-d})/d = \ln G(A_{i,t-d}, S_{i,t-d}) + \eta_{i,t} \tag{2}$$

where d is the number of years between the beginning and the end of the observation period, A is firm age and $\eta_{i,t}$ is a random error. Variyam and Kraybill (1992) and Mata (1994) for example use the same approach.

Evans (1987b) reports that firm growth decreases with firm age and firm size. Adherents of the first school would say that the negative relation between firm size and growth may be just the result of "regression-to-the-mean" bias. However, as illustrated in Table I in our opinion the correction for the "regression-to-the-mean" bias is only useful if firms show temporary changes in employment, but if firms grow or shrink persistently then the correction for the "regression-to-the-mean" bias – suggested by Davis *et al.* – is inappropriate. Moreover, there is ample empirical evidence to doubt that equation (1) describes the dynamics of firm size. We provide three illustrations.

First, even if the "regression-to-the-mean" bias is relevant but nevertheless the regression framework of equation (2) has been used, it is possible to derive a theoretical probability limit value for the regression coefficient for the size variable. This value equals $-\sigma_\varepsilon^2/(d\sigma_\varepsilon^2 + d\text{var}(X_i\beta))$, in a two-period model where a linear form $\ln G = \alpha_0 + \alpha_1 \ln S_{i,t-d}$ in equation (2) is chosen. We find, for example, in Evans (1987b) that the regression coefficient for firms younger than 46 years of age is more negative than this theoretical value. We conclude that the growth-size relation found in Evans (1987b) cannot generated by a "regression-to-the-mean" model as in equation (1). This also holds for some older studies, like Prais (1976), where even a significantly positive effect of initial size on growth is found up till the 1960s. Such a positive coefficient can in no case be the consequence of equation (1).[6]

Second, Boeri and Cramer (1992) claim for German establishments in the period 1977–1990 that the growth-size relation is not the result of a "regression-to-the-mean" bias only. They model growth of incumbents as a first-order Markov process and reject the hypothesis of stationarity of the Markovian transition matrix. Stationarity is needed if the growth-size relation would just be the result of a "regression-to-the-mean" bias.

Third, in several previous growth-size studies a temporal analysis on firm growth has been carried out.[7] A positive, but usually small, autocorrelation is generally found in such studies. From equation (1) one would expect this autocorrelation to be negative.

We propose to decompose firm growth into a temporary and a permanent component.[8] If data on firm size are available in every year over a relatively long time period – for instance 15 years like in Davis *et al.* – one could regress firm size on a time trend. The predicted size – based on the regression results – may be considered to be the "permanent" size, while we define the deviation between the actual and the predicted size as the temporal component. The permanent size in the initial year may be used in the growth-size relation to avoid the regression fallacy. Moreover, the comparison of the results of the growth-size relation with those using initial size or average size will provide information on the relevance of the correction for the regression fallacy. Besides, the coefficient in the size-time regression gives an indication whether a firm fluctuates only temporarily or whether the firm's size also changes persistently.

2.3. *Confusion between net and gross creation*

Davis *et al.* mention the confusion between net and gross job creation as the third and last misleading interpretation of the data resulting in the conventional wisdom of the job creation prowess of small businesses. We agree with Davis *et al.* that conclusions about the job generation power of small businesses should be drawn upon net job creation – defined as gross job creation minus gross job destruction – instead of gross job creation. But in our opinion well-known recent academic studies on gross job flows – like Dunne *et al.* (1989a), Boeri and Cramer (1992), Davis and Haltiwanger (1992), OECD (1994, chapter 3) and Konings (1995a,b) – do not present misleading statistics, while in the growth-size literature growth of employment of course equals the net job creation rate.

3. The other findings and conclusions

The second conclusion states that in many previous studies data bases are used that are not suitable for drawing inferences about the rela-

tionship between employer size and job creation. Davis *et al.* explain this conclusion in their section 8. They state that the Dun and Bradstreet market identifier files (DMI) suffer from inaccuracy with respect to the coverage of total employment and of the entries and exits of firms. However, a complete account of employment figures is not necessarily indispensable for an investigation of job flows. More important is that the data base used is a representative sample from the population of firms. Audretsch (1995) claims that the Small Business Data Base (SBDB), which is derived from the DMI, is remarkably consistent with the US Census of Manufactures and the Bureau of Labor Statistics. Besides, Davis *et al.* base their conclusion on data bases in the US. They do not judge the databases collected outside the US which are used in studies on gross job flows or on growth-size relations.

In our opinion the third conclusion of Davis *et al.* is misleading and at least inappropriate to judge the job creation prowess of small businesses. Indeed, large firms created more jobs than small business did in the US manufacturing industries over the 1972–1988 period. But, related to their employment share small firms created more jobs than their large counterparts. To be more precise, large firms, defined as firms with at least 500 employees, created 53 percent of the new jobs but their employment share is 65 percent. Besides, large firms destroyed 56 percent of the jobs, which is higher than their share of 53 percent in job creation.[9]

The fourth finding that survival rates for new and existing manufacturing jobs increase sharply with employer size is not surprising and consistent with the common finding in the literature that survival rates increase with firm size.[10] The relevant question of course is not whether small establishments have higher exit rates but whether the higher growth rates of successful small firms are large enough to compensate for their higher discontinuance rates. From Table III of Dunne *et al.* (1989b) and from Cooper *et al.* (1989) it is indeed clear that this is the case: when taking the growth rate of failures to be –100% small firms on average still grow more strongly than large firms do.

The fifth and final conclusion is that smaller manufacturing firms and plants exhibit sharply higher *gross* rates of job creation but not higher *net* rates. Davis *et al.* reach this conclusion using the average plant size measure to correct for the "regression-to-the-mean" bias. We already showed that this correction may be inappropriate. Moreover, when using the regression-to-the-mean correction proposed by Davis *et al.*, Baldwin and Picot (1995) still find a higher net job creation rate of firms in the small size classes for Canada. Konings (1995b) not only finds that gross rates of job creation decrease with firm size, but also that gross job destruction rates increase with firm size in the U.K. during the 1980s. This implies that the net job creation rates in the U.K. are a lot higher for small firms when compared to their larger counterparts.

4. Summary

- The first conclusion about the conventional wisdom about the job creation prowess of small firms is not based on the general conclusion in *academic* studies, while the suggestion for correcting for the "regression-to-the-mean" bias is debatable.
- The second finding overlooks that an incomplete data base can nevertheless be representative and is focused only on the U.S., and has therefore to be investigated for the many data bases which are used in studies outside the U.S.
- The third finding does not favour the job creation power of large firms above small ones.
- The fourth finding is well known but does not address the relevant question.
- The fifth finding may be true for the US but this finding may not to be generalized to other countries.

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Notes

[1] Also in the theoretical literature on industry dynamics the existence of a unique equilibrium firm size is debated. For instance, Jovanovic (1982) assumed agents to be of intrinsic, unchanging "types" which are revealed when participating in the industry. In this sense his model is a dynamic extension

of the model of Lucas (1978). Firm sizes have an equilibrium value in these models. A recent, alternative, approach to industry dynamics is developed by Ericson and Pakes (1995). They do not assume a passive learning process of an already fixed "type" but allow firms to explore and exploit speculative ideas. As a result, firms do not have an equilibrium size and even are bound to disappear from the industry in the long run.

[2] See for instance Dunne *et al.* (1988), Baldwin and Gorecki (1991), Cable and Schwalbach (1991), Geroski (1991) and Wagner (1994).

[3] See for instance Evans (1987a,b) and follow up studies. Surveys on the growth-size literature are provided by for example Boeri (1989), Wagner (1992) and Klomp and Thurik (1994).

[4] We set up Table I in the same fashion as box 4 in Davis *et al.* Thus, we intend to show that the illustration of the regression fallacy by Davis *et al.* may not be generalized.

[5] Leonard (1986) allows firms to adjust their stock of human capital employed over more than one period of time. However, this extension does not change the basic argument of the "regression-to-the-mean" bias.

[6] The effect of firm size on growth was found by Prais (1976) to be positive till the late 1960s. Since then, however, most studies have reported a negative effect. It appears therefore that in some periods large firms grow faster while in other periods small ones do. These empirical results are consistent with Gartner and Shane (1995) who report that the number of firms per capita decreases during the 1950s and 1960s, remains stable during the 1970s and starts to increase quite considerably during the 1980s. It is also consistent with Acs *et al.* (1995) who show that, on average, self-employment rates in the OECD countries decrease in the 1965–1977 period and increase afterwards.

[7] See, for instance, Boeri (1989), Wagner (1992) and Klomp and Thurik (1994) for some references.

[8] Our concept to avoid the regression fallacy comes close to the decomposition of income into a permanent and transitory component. See Friedman (1992). He mentions the example of the job creation prowess of small firms as an illustration of the regression fallacy, but does not present a solution. See also Cochrane (1988) for a model of fluctuations in GNP as temporary deviations from a deterministic trend.

[9] These observations are in line with Carlsson (1989) where a decrease in the Fortune 500 employment share in total manufacturing is observed for the 1975–1985 period; this share was still 78.7 per cent in 1975, while it dropped to 72.5 per cent ten years later.

[10] See for instance Freeman *et al.* (1983), Evans (1987b), Dunne *et al.* (1989b) and Audretsch and Mahmood (1995). It is a common practice to correct for the selection bias which occurs in the growth-size regression as a consequence of small firms failing more frequently than large firms. However, Evans (1987b) finds barely any change in the regression results when using such a correction. A consequence of such a correction is that entry and exit of firms are treated asymmetrically. Therefore, one might wonder whether such a selectivity bias correction is appropriate.

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