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Growth volatility and size: A firm-level study[☆]

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ABSTRACT

This paper provides a systematic cross-country investigation of the relation between a firm's growth volatility and its size. For the first time the analysis is carried out using comparable and representative sets of data sourced by official business registers of an important number of countries. We show that there exists a robust negative relation between growth volatility and size with an average elasticity equal to −0.18. We check the robustness of this result against a number of potential sources of bias and in particular with respect to sectoral disaggregation and against the inclusion of firm age. Our result is consistent with the idea that independently from specific country characteristics there exists a common underlying mechanism driving the elasticity between size and growth volatility. We then propose two mechanisms able to explain our result and we conclude discussing its relevance with respect to the recent literature on granularity.

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1. Introduction

Is the growth dynamics of business firms tied-up with their size? In trying to answer this question the literature has largely focused on the relation between a firm's size and its average growth rate,[1] while only a small number of studies have investigated if there exists a link between a firm's size and the volatility of its growth.[2] After the first evidence in

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[☆] The views expressed here are those of the authors and cannot be attributed to the OECD or its member countries. The DynEmp (Dynamics of Employment) project would not have progressed this far without the active participation of all members of the DynEmp network and, in particular, of national delegates (listed in Table A1) from the OECD Working Party on Industry Analysis (WPIA). The authors would like to thank the Editor and two anonymous referees for their valuable suggestions. The authors would also like to thank participants to seminars at the OECD, Scuola Superiore Sant'Anna and Paris School of Economics. Regarding the United Kingdom, this work contains statistical data from ONS which is Crown Copyright. The use of the ONS statistical data in this work does not imply the endorsement of the ONS in relation to the interpretation or analysis of the statistical data. This work uses research datasets which may not exactly reproduce National Statistics aggregates. Access to French data benefited from the use of Centre d'accès sécurisé aux données (CASD), which is part of the "Investissements d'Avenir" program (reference: ANR-10-EQPX-17) and supported by a public grant overseen by the French National Research Agency. Angelo Secchi acknowledges financial support from the European Union Horizon 2020 research and innovation programme under grant agreement No. 649186 (ISIGrowth).

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[1] See Lotti et al. (2003) for a review of the literature originating from the pioneering work by Gibrat (1931).

[2] Conceptually, cross-sectional variance (or standard deviation) is a measure of between-firm dispersion of growth rates at a given time while volatility is a measure of within-firm variation of growth rates over time (rolling window). The two concepts are, however, very related. Empirically Davis et al. (2007), using Compustat data show that, while capturing different aspects of business dynamics, the two measures track each other well. Using a different data source Calvino et al. (2016) provides further support to the existence of a positive correlation between volatility and dispersion.

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Hymer and Pashigian (1962) recent estimates obtained on U.S. companies support the idea that larger firms tend to display a less volatile growth dynamics than smaller ones (Stanley et al., 1996). These pieces of evidence remain, however, to a large extent inconclusive. First, as suggested in Gabaix (2011), these estimates may well be biased since they are obtained focusing on large listed companies only.[3] Second, as recently discussed in Di Giovanni and Levchenko (2012), the extent to which results for the U.S. economy can be generalised to other countries is unclear.[4]

This paper overcomes both these limitations providing the first systematic cross-country investigation of the relation between a firm's growth volatility and its size, using an original data source containing comparable and representative data on business firms for 20 countries. We show that there exists a robust negative relation between the volatility of growth and size: averaging across countries, an increase by 10% of a firm's size is accompanied by a 1.8% decrease of its growth volatility. This relation appears quite homogeneous across countries, with 17 out of 20 countries characterized by an estimated elasticity lying in the interval $[-0.24, -0.16]$. We check the robustness of our result against a number of potential confounding factors and, in particular, we show that it is not an artifact due to the aggregation of firms belonging to different industrial sectors and that it is not entirely driven by firms' age. Our estimates suggest the striking result that economies that are very different in terms of size, industrial structure and institutional framework show very similar estimated elasticity. This is consistent with the idea that, independently from specific country characteristics, there exists a common underlying mechanism generating the relation between firm size and growth volatility.

Quantifying the elasticity between a firm's size and its growth volatility and assessing the extent to which this relation is common across diverse countries is important for a number of reasons. At the micro level, it can help discriminating among different theories of firm growth that are generally grounded on the assumption that a firm can be seen as an aggregation of several elementary units. Indeed, the fact that we observe an elasticity not far from -0.18 provides evidence against a simple model where these elementary units display similar size and their growth dynamics are independent. On the contrary, our result can be interpreted alternatively as supporting the existence of some correlation among sub-units (Mansfield, 1962 and Boeri, 1989), of a hierarchical structure among sub-units (Amaral et al., 1997b), or of a fat-tailed distribution of the size of sub-units (Fu et al., 2005; Riccaboni et al., 2008; Sutton, 2002). Bottazzi and Secchi (2006) show that if the probability that a firm diversifies into a new sub-market (i.e., generating a new sub-unit) increases with the number of existing sub-units, the negative relation between growth volatility and size can be traced back to a more fundamental positive correlation between a firm's size and the number of its sub-units.

At the macro level, assessing the existence of the scaling relation between growth volatility and size is important to determine the extent to which micro-level volatility is associated with aggregate fluctuations (see Comin and Mulani, 2006, Comin and Philippon, 2006 and Davis et al., 2007). In granular economies Gabaix (2011) shows that the mechanism which transmits microeconomic shocks into aggregate fluctuations is limited by the extent to which large firms present less volatile growth patterns than smaller ones. In the same vein, Di Giovanni and Levchenko (2012) show that the increase in aggregate volatility due to trade opening is magnified when a firm's volatility scales down with its size. In their model, a scaling elasticity of about -0.17 almost triplicates the contribution of trade to aggregate fluctuations.[5]

This paper is organized as follows. Section 2 describes the data and defines the variables used in the empirical investigation. Section 3 presents the main result together with an extensive set of robustness checks. Section 4 provides an economic interpretation of the coefficient of interest in terms of firm diversification and discusses its relevance for the transmission of micro-economic shocks into aggregate fluctuations. Section 5 concludes.

2. Data

The data used in this study come from a distributed data collection exercise aimed at creating a harmonized cross-country micro-aggregated database sourced from firm-level data collected in national business registers.[6] For example the data sources for France and the U.S. are "Fichier Complet Unifié de SUSE" (FICUS) and Census Bureau's Business Dynamics Statistics (BDS) and Longitudinal Business Database (LBD) respectively, which are both built on administrative data with a quasi-universal coverage. These are the typical data used for studies using firm size such as Garicano et al. (2016) and Haltiwanger et al. (2013). The high representativeness of the underlying data sources and the large country coverage are two of the key features that make our dataset unique and particularly suitable for the present investigation.

These data are produced within the DynEmp project led by the OECD, with the support of national delegates and national experts of member and non-member economies. The DynEmp project builds upon the distributed micro-data methodology proposed by Bartelsman et al. (2004) for analysing and comparing harmonized firm demographics across countries.[7]

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[3] Similarly Capasso and Cefis (2012) discuss the effects of the existence of natural and/or exogenously imposed thresholds in firm size distributions on estimations of the relation between firm size and the variance of firm growth rates.

[4] The elasticity between growth volatility and size has been found close to -0.1 with a sample of French manufacturing firms (Coad, 2008) and practically zero with a sample of Italian manufacturing firms (Bottazzi et al., 2007).

[5] Another related stream of research analyses focuses on business cycles, with particular attention to the countercyclical nature of microeconomic volatility (see Decker et al., 2016 and Ilut et al., 2014).

[6] "Micro-aggregated" refers to the fact that the aggregation is much finer than what can be found in more common country-sector-year databases. Other data sources, beyond standard business registers, include social security records, tax records, censuses or other administrative sources. See Calvino et al. (2016) for further details.

[7] Details on the data collection and harmonisation procedure are discussed extensively in Criscuolo et al. (2015).

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