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Please cite this paper as:

Calvino, F., C. Criscuolo and C. Menon (2016-04-01), "No Country for Young Firms?: Start-up Dynamics and National Policies", *OECD Science, Technology and Industry Policy Papers*, No. 29, OECD Publishing, Paris.
http://dx.doi.org/10.1787/5jm22p40c8mw-en

OECD Science, Technology and Industry Policy Papers No. 29

No Country for Young Firms?

START-UP DYNAMICS AND NATIONAL POLICIES

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FOREWORD

This paper was authored by Flavio Calvino (Scuola Superiore Sant'Anna; Paris School of Economics – University Paris 1 and OECD Directorate for Science, Technology and Innovation), Chiara Criscuolo (OECD Directorate for Science, Technology and Innovation) and Carlo Menon (OECD Directorate for Science, Technology and Innovation).

The Committee on Industry, Innovation and Entrepreneurship (CIIE) declassified this paper in October 2015.

Note to Delegations:

This document is also available on OLIS with the cote:
DSTI/IND(2015)16/FINAL

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NO COUNTRY FOR YOUNG FIRMS? START-UP DYNAMICS AND NATIONAL POLICIES

Flavio Calvino[1], Chiara Criscuolo[2] and Carlo Menon[3]

The paper provides new cross-country evidence on the links between national policies and the growth patterns of start-ups. In particular, it compares for the first time the heterogeneous effects of national policies on entrants and incumbents, within the same country, industry, and time period. A number of key facts emerge. First, start-ups in volatile sectors and in sectors that exhibit higher growth dispersion are significantly more exposed to national policies than start-ups in other sectors. Second, start-ups are systematically more exposed than incumbents to the policy environment and national framework conditions. Third, the results suggest that timely bankruptcy procedures and strong contract enforcement are key to establishing a dynamic start-up environment.

ACKNOWLEDGEMENTS AND DATA DISCLAIMER

This paper reflects results from the DynEmp (Dynamics of Employment) project. This project would not have progressed this far without the active participation of national delegates from the OECD Working Party on Industry Analysis (WPIA) and other members of the DynEmp network. Their support has been essential for allowing access to national business registers and for improving the process and the methodology of the data collection through comments, suggestions, and technical advice. The authors would like to sincerely thank all the contributors listed in Table 1 for making the DynEmp project possible, while retaining all responsibilities for errors and omissions in this document. The authors are also extremely grateful to Nick Johnstone, Catherine L. Mann, Javier Miranda, Dirk Pilat, Mariagrazia Squicciarini, and Andrew Wyckoff for useful discussions, and to Isabelle Desnoyers-James for excellent statistical assistance. The paper also benefited from comments from national delegates to the Committee on Industry, Innovation and Entrepreneurship; the Working Party on Industry Analysis; and the Working Party on SMEs and Entrepreneurship of the OECD.

Table 1. Contributors to the DynEmp v.2 data collection

Countries included in the dataset used for this paper

Country	National representative(s)	Institution(s)
Austria	Werner Hoelzl	WIFO Institute (Austrian Institute of Economic Research)
Belgium	Michel Dumont, Chantal Kegels, Hilde Spinnewyn	Federal Planning Bureau
Brazil	Carlos Henrique Leite Corseuil, Gabriel Lopes de Ulyssea	IPEA - Instituto de Pesquisa Econômica Aplicada
Canada	Pierre Therrien, Jay Dixon, Anne-Marie Rollin, John Baldwin	Industry Canada and Statistics Canada
Costa Rica	David Bullon Patton	Ministry for Foreign Trade
Denmark	Dorte Høeg Koch, Morten Skov Poulsen	Ministry for Business and Growth
Finland	Mika Maliranta	The Research Institute of the Finnish Economy (ETLA) and Statistics Finland
Hungary	Adrienn Szep Szollosine, Erzsebet Eperjesi Lindnerne, Gabor Katay, Peter Harasztosi	Central Bank of Hungary, Hungarian Central Statistical Office
Italy	Stefano Costa	Italian National Institute of Statistics (ISTAT)
Japan	Kyoji Fukao, Kenta Ikeuchi	Hitotsubashi University and National Institute of Science and Technology Policy
Luxembourg	Leila Peltier – Ben Aoun, Chiara Peroni, Umut Kilinc	STATEC
Netherlands	Michael Polder	Statistics Netherlands (Centraal Bureau voor de Statistiek)
New Zealand	Lynda Sanderson, Richard Fabling	New Zealand Treasury, Motu Economic and Public Policy Research and Statistics New Zealand
Norway	Arvid Raknerud, Diana-Cristina Iancu	Statistics Norway and Ministry of Trade and Industry
Portugal	Jorge Portugal	Presidencia da Republica
Spain	Valentin Llorente Garcia	Spanish Statistical Office
Sweden	Eva Hagsten	Statistics Sweden
Turkey	Faik Yücel Günaydın	Ministry of Science, Industry and Technology
United Kingdom	Michael Anyadike-Danes	Aston Business School

EXECUTIVE SUMMARY

The paper provides new cross-country evidence on the links between national policies and the growth patterns of start-ups. In particular, for the first time it is possible to compare the heterogeneous effects of national policies on entrants and incumbents, within the same country, industry, and time period. The analysis is motivated by the hypothesis that policy settings, whether by design or accident, may disproportionately benefit incumbents. New or prospective entrants, conversely, may be more negatively affected by policies or framework conditions which hinder growth or impose an extra-cost on risk. This is particularly important in the light of the key contribution of start-ups to job creation across OECD member countries.

By allowing "exposure" to a particular policy to vary across sectors depending on their employment growth dispersion, financial input intensity and employment growth volatility, the analysis uncovers four policy-relevant findings, distinguishing between impacts on start-ups and on established firms.

First, start-ups in volatile sectors and in sectors that exhibit higher growth dispersion are significantly more exposed to national policies and framework conditions – i.e., their entry and growth performance appear to be more correlated to the policy environment – than those of start-ups in other sectors. This highlights the importance on the one hand of promoting policies explicitly aimed at lowering risk (e.g. improving access to finance), and on the other hand of tackling policy failures that are implicitly imposing an extra cost on risk (such as poor contract enforcement).

Second, start-ups are systematically more exposed to the policy environment and the national framework conditions than incumbents. This might reflect the fact that due to credit constraints and weaker resilience relative to incumbents, start-ups are more subject to the vagaries of the policy environment. At the same time, the prevailing policy environment may have been implicitly designed with the needs and conditions of incumbents in mind. Even if this is not the case, start-ups' more limited market experience may mean that they are less aware of the characteristics of the policy environment to which they are subject, potentially increasing adjustment costs.

Third, the results suggest that timely bankruptcy procedures and strong contract enforcement are key to establishing a dynamic start-up environment. The results also point to the importance of access to finance, a result already well-established in the economic literature.

Fourth, the results suggest that a firm's likelihood of exiting in the first three years of activity in highly volatile sectors, in sectors with high growth dispersion, or in financially dependent sectors, is not related to policy factors. The policy indicators used in the analysis, however, are often significantly related to the survival share of incumbents rather than entrants, especially in financially dependent sectors (and to a lesser extent, in sectors with high growth dispersion and volatility). These results seem in line with models of learning whereby the first few years after entry are inherently turbulent because new businesses are uncertain about their "type". The results may also suggest that some policies may have the unintended effect of slowing down the reallocation process by increasing the chances of incumbents' survival.

1. Introduction

A number of recent contributions have highlighted the importance of young firms for employment growth (Haltiwanger, Jarmin and Miranda, 2013, for the United States; Lawless, 2014, for Ireland; Eslava and Haltiwanger, 2012, for Colombia). Recent OECD work (Criscuolo, Gal, and Menon, 2014) shows that in a sample of 17 OECD countries plus Brazil, young firms account for an average of only 17% of employment, but they create 42% of jobs.

Although the prominent role of young firms in job creation is an empirical regularity that holds across all economies examined so far, cross-country data reveal important differences in start-up dynamics, namely in the net job contribution by start-ups and its components: entrepreneurship rate, in the average size at entry, and in the post-entry growth in the first years of activity (Calvino, Criscuolo and Menon, 2015). As a result, the net job contribution by surviving start-ups also presents some noteworthy variation across economies. Beyond employment growth, new and young firms are also crucially important for productivity growth (Foster, Haltiwanger and Syverson, 2008; Aghion et al., 2004) and for introducing disruptive innovations (Henderson and Clark, 1990), e.g. in the green economy (Hockerts and Wüstenhagen, 2010).

National policies and framework conditions are likely to play an important role in explaining these cross-country differences. The policy environment can indeed facilitate (or hamper) experimentation, namely the degree to which entrepreneurs are able to enter the market to test innovative business ideas, eventually growing fast if the project proves to be successful, or exiting smoothly if it does not. Access to finance and bankruptcy regulations are two crucial policy areas in this respect – shaping firm entry and exit conditions, respectively. The strength of contract enforcement and the overall efficiency of the judicial system may also be relevant factors in explaining cross-country differences in start-up dynamics. Newly-born businesses without an established market record can experience additional difficulties in obtaining external finance or credit if contracts are weak. Weak contracts also lead parties to rely more on relational contracting, with reputation embedded in long-term bilateral relationships favouring incumbents over entrants (Johnson, McMillan and Woodruff, 2002).

Calvino, Criscuolo and Menon (2015) set up a comprehensive analytical framework to analyse start-up employment dynamics across countries using the recently collected DynEmp v.2 dataset. This paper extends the analysis using the same dataset and analytical framework to assess the role of national policies and framework conditions in explaining international differences in start-up dynamics.

Thanks to the unprecedented granularity of the DynEmp v.2 dataset, the econometric analysis provides new cross-country evidence on the distinctive growth pattern of start-ups. In particular, for the first time it is possible to disentangle the heterogeneous effects of national policies on entrants and incumbents, respectively, within the same country, sector, and time period. This is particularly important in light of the fact that incumbents have greater opportunities than new (or prospective) entrants to influence policymaking, or to adapt to the existing policy environment.[4] These opportunities include both regulatory design and support policies.

The results uncover new and policy-relevant evidence in several areas. In particular, the paper sheds new light on the extent to which firms are affected by policies. By allowing "exposure" to a particular policy to vary across sectors depending on their employment growth dispersion, financial input intensity and employment growth volatility, the analysis uncovers four policy relevant findings, distinguishing between impacts on start-ups and established firms.

First, start-ups in volatile sectors and in sectors that exhibit higher growth dispersion are significantly more exposed to national policies and framework conditions – i.e., their entry and growth performance

appear to be more correlated to the policy environment than those of start-ups in other sectors. This highlights the importance of promoting policies explicitly aimed at lowering risk (e.g. improving access to finance) on the one hand, and, on the other hand, of tackling policy failures that are implicitly imposing an extra-cost on risk (such as poor contract enforcement).

Second, start-ups are systematically more exposed than incumbents to the policy environment and the national framework conditions. This might reflect the fact that due to credit constraints and weaker resilience relative to incumbents, start-ups are more subject to the vagaries of the policy environment. At the same time, this policy environment may have been implicitly designed with the needs and conditions of incumbents in mind. This may also depend on regulation being tailored to the prevailing technology adopted by incumbents, rather than to the innovative technology used by the start-ups. Even if this is not the case, their more limited market experience may mean that they are less aware of the characteristics of the policy environment to which they are subject, potentially increasing adjustment costs.

Third, the results suggest that timely bankruptcy procedures and strong contract enforcement are key to establishing a dynamic start-up environment. The results also point to the importance of access to finance, a result already well-established in the economic literature.

Fourth, the results seem to suggest that a firm's likelihood of exiting in the first three years of activity in highly volatile sectors, in sectors with high growth dispersion, or in financially dependent sectors, is not related to policy factors such as bankruptcy legislation, availability of finance or judicial efficiency.[5] These policy indicators, however, are often significantly related to the survival share of incumbents, especially in financially dependent sectors (and, to a lesser extent, in growth dispersed and volatile sectors). On the one hand, these results seem in line with models of learning (e.g. Jovanovic, 1982) whereby the first few years after entry are inherently turbulent because new businesses are uncertain about their "type", only learn about it once they start operating and will exit if they are not of the right "type". On the other hand, the fate of incumbent firms, i.e. whether they can survive even if their productivity is low or whether they manage to overcome periods of low demand, is much more likely to depend on the policy environment, the availability of finance, and on the level of competition in the banking sector.

It is worth mentioning, however, that the work discussed in this paper is exploratory along several dimensions. First, this is one of the first contributions that looks at entry, survival, and growth of businesses with a cross-country perspective and that links these phenomena to the policy environment. Second, the construction of cross-country policy indicators is clearly a field in which there is still room for further improvement, and the reader should bear this in mind when interpreting the results of this paper. Third, the definition of the phenomenon of "firm entry" (and, relatedly, of young firms) presents a number of methodological and conceptual challenges. A similar caveat applies to firm exits: for instance, some exits of young firms may be due to a successful acquisition by a bigger entity.

The OECD DynEmp project has pointed to a number of empirical regularities that hold across countries *despite* possible methodological differences in definitions and data collection procedures across countries. When focusing on cross-country differences, however, these issues become more important and should be carefully considered. While the econometric analysis partials out some of the country-specific "noise", further work on the harmonisation of the key definitions would represent a big step forward for this kind of analysis and more broadly for policy analysis in this area.

2. The role of finance, bankruptcy, and contract enforcement for firm growth

The econometric analysis takes as a starting point the large body of economic literature on how access to finance, bankruptcy legislation and contract enforcement may affect business growth. In the following

subsections, in order to better contextualise this paper, each of these factors is examined in detail, with a particular focus on the effects in the early years of a firm's lifecycle.

2.1. Access to finance

Difficulties in accessing finance are extensively recognised as one of the major obstacles for starting and growing a new business (Kerr and Nanda, 2009). Lack of finance typically prevents new ventures from investing in innovative projects, improving their productivity, financing their growth, covering working capital requirements and meeting market demand.

Capital markets and financing transactions are in general affected by problems of adverse selection and moral hazard, which might be exacerbated in the case of young innovative businesses. These entrepreneurs may suffer greatly from being liquidity constrained because of their lack of credit history and collateral to secure a loan. The adverse consequences of credit constraints are particularly severe in intangible intensive activities, such as innovation and services, as young innovators often lack physical assets (e.g. buildings; machinery; real estate, etc.) to offer as collateral. Even if their prospective investments in innovative activities were profitable, they are thus often unable to access credit (Cabral and Mata, 2003). This is further supported by a number of empirical studies. For instance, from a within-country perspective, Bottazzi, Secchi and Tamagni (2014) recently argued that financial constraints prevent potentially fast-growing firms – especially young ones – from taking advantage of attractive growth opportunities. These market failures justify the need for policy interventions aimed at facilitating access to finance, especially for new – often small – innovative entrepreneurs.

Access to finance and start-ups' financial structures at inception are intrinsically linked to the characteristics of a start-up's assets and entrepreneurs' attributes (Mann and Sanyal, 2010). The difficulties that innovative entrepreneurs experience stem from several sources: they typically lack collateral and a track record (Evans and Jovanovic, 1989; Hurst and Lusardi, 2004); they are involved in innovation processes whose outcomes are uncertain; they deal with a non-rival good – knowledge – whose returns are highly unpredictable; and they own assets whose nature may be intangible and difficult to evaluate (e.g. patents; see Auerswald, 2007), particularly as entrepreneurs might not want to disclose information to investors on their innovations, due to the risk of imitation.

The importance of different types of finance varies across the stages of business development and across different business activities. During the seed and start-up stages, entrepreneurs, especially in technology-driven high-growth areas, can often obtain financing only from their own resources or from personal connections, as the information asymmetry is generally too high to be manageable for professional investors and credit providers. Subsequently, once the business project is more advanced, self-financing may be supplemented by seed capital investment from informal private investors (e.g. business angels) and to a lesser extent by seed financing funds and venture capitalists (Denis, 2004) for high-risk low capital-intensive ventures, and by credit institutes (e.g. banks) for high capital-intensive low-risk activities. In the expansion stage, young firms generally require increasing amounts of equity to maintain R&D and to expand marketing and sales activities, amounts that are typically only available through other sources, such as initial public offerings on stock exchanges and project financing.

Financial market development and competition in the financial sector crucially mediate the way in which businesses in need of external finance can access credit, influencing the extent to which financial constraints are binding. Notably, a range of theoretical contributions suggest that most developed financial systems ease external financing constraints, ultimately boosting economic growth (see Levine, 2005 for a review).

On the empirical side, using the seminal methodological approach proposed by Rajan and Zingales (1998), a number of studies corroborate the fact that industries more dependent on external finance grow relatively faster in countries with more developed financial markets (Beck et al., 2008; Aghion, Fally and Scarpetta, 2007; Alfaro and Charlton, 2007; De Serres et al., 2006; Klapper, Laeven and Rajan, 2006 among others).

In a framework similar to the one used in this paper, Aghion, Fally and Scarpetta (2007) exploit a harmonised firm-level database, including data from 16 countries, in order to evaluate the role of financial development on entry, entry size and post-entry growth of new firms. Their findings confirm the important role of financial development, especially for the entry of small firms in those sectors that mostly depend on external finance.[6] The authors emphasise that finance not only boosts entry, but also improves post-entry performance of firms, even when controlling for the size of entrants. Results are robust to the inclusion of other policy variables, such as employment protection legislation (EPL) indicators. Finally, Aghion, Fally and Scarpetta (2007) highlight that stock market capitalisation and private credit also positively affect entry and post-entry growth.

Relatedly, Klapper, Laeven and Rajan (2006), using Amadeus (a commercial database on European firms), assess the effects of market entry regulations on entry, average size of entrants and growth of incumbents. They emphasise how financial development has a positive effect on firm entry in sectors which mostly depend on external finance. They also suggest that other entry regulations have detrimental effects on entry, especially in sectors that should have naturally higher entry rates. In countries that have higher entry barriers, entrants are larger, and labour productivity grows more slowly in naturally high entry industries.

Given the consensus on the market failures affecting access to credit for young and small firms, governments have put in place a number of polices in the field. Public institutions can for example: guarantee part of the losses caused by the potential default of the borrower (e.g. public credit guarantee programmes, see Lelarge, Sraer and Thesmar, 2008 for an evaluation of such a programme in France; and d'Ignazio and Menon, 2013, in Italy); offer credit mediation to companies in the case of a loan rejection; subsidise loans directly (e.g. through the intermediation of a national development bank); support alternative types of debt finance, such as convertible loans and subordinated loans (e.g. through fiscal incentives to lenders and the partial coverage of losses in case of bankruptcy); create public funds that directly invest in start-up firms; establish public "fund-of-funds" that invest in private venture capital firms; promote co-investment funds that use public money to match private investment. Governments can also support networks of angel finance, and set the framework conditions for new sources of financing, such as crowdfunding (Wilson and Silva, 2013).

2.2. Bankruptcy regulation and contract enforcement

The decision of an entrepreneur to engage in risky investments, as well as the decision of intermediaries to financially support the investment, are also critically affected by the legal and financial consequences of failure and by the agents' trust in contract enforcement. These are in turn shaped by countries' legal and institutional frameworks concerning bankruptcy and by the efficiency and speediness of the civil justice system.

The theoretical predictions of the impact of bankruptcy laws on entrepreneurship, growth and innovation cuts both ways. On the one hand, tighter bankruptcy laws will hamper entrepreneurship, growth and risky investments as it poses a greater burden on entrepreneurs in case of failure. On the other hand, tighter bankruptcy laws also represent a strong guarantee for investors, making access to credit easier and cheaper and thus facilitating risky investments. The expected impact of tougher bankruptcy rules is

therefore ambiguous, because of the two opposing effects arising from the trade-off between the insurance against business failure and the effects on credit supply.

Different countries are characterised by heterogeneous bankruptcy regulations. Cross-country differences are particularly evident for both personal and corporate bankruptcy regulations. Concerning personal bankruptcy, heterogeneity emerges in terms of the availability and timing of discharge, the level of complexity of a discharge in agreement with creditors, and the degree of economic and civic disabilities imposed on the debtor, which is in turn linked to different consequences in terms of stigma of failure (see for instance Armour and Cumming, 2008 for additional details). Recent cross-country evidence by Lee et al. (2011) suggests that entrepreneur-friendly bankruptcy regulations are positively associated with entrepreneurship development (see also Peng, Yamakawa and Lee, 2010). This is in line with previous evidence on bankruptcy and entry regulation for European firms (Klapper, Laeven and Rajan, 2006). Several variables measuring different aspects of the personal bankruptcy law are available in Armour and Cumming (2008), although for a rather limited set of countries.

In terms of corporate bankruptcy, differences across countries emerge along many dimensions, such as the debtor's burden to file a reorganisation, the extent to which secured creditors are able to seize their collateral (i.e., "automatic stay" versus "asset freeze"), the priorities according to which secured creditors are paid in the liquidation process (with respect to governments or other creditors), the degree to which management is able to retain administration of its property during the resolution of the reorganisation process and the relative frequency of usage of bankruptcy procedures (see for instance La Porta et al.,1998 and Claessens and Klapper, 2005 for further discussion). Cross-country evidence (de Serres et al., 2006) highlights that policies improving the efficiency of bankruptcy procedures are found to foster labour productivity and value-added growth, notably in sectors most dependent on external finance, and to be positively associated with GDP investment share (Succurro, 2012). Proxies for the efficiency of the corporate bankruptcy framework of a country have been collected within the "Doing Business" project of the World Bank Group, as discussed in more detail in Section 3.4.

The degree of judicial efficiency and more specifically the ability to enforce contracts and resolve disputes in a transparent and timely manner are fundamental features of well-functioning market economies. In some countries, even if comprehensive laws are in place to determine the settlement of contractual disputes, the court system itself can be inefficient, as trials can be costly, slow, or plagued with corruption. Indicators of contract enforcement reflect the degree of judicial efficiency present in a country. This measure of judicial efficiency allows for the disentangling of the more general effects associated with court enforcement, from the more specific content of the different laws in place.

Efficient judicial systems have been found to be intrinsically related to different firm-level variables. First of all, the efficiency of judicial system is positively associated with larger average firm size (see for instance Kumar, Rajan and Zingales, 2001; Beck, Demirguc-Kunt and Maksimovic, 2006; Laeven and Woodruff, 2007; Fabbri, 2010; Giacomelli and Menon, 2013). Furthermore, proper contract enforcement practices improve the predictability of business relationships and reduce ambiguity. By means of this channel, weak contractual enforcement frameworks prove to be negatively linked with entrepreneurship. Newly-born businesses (without an established market record and with highly uncertain future revenues) can experience additional difficulties in obtaining external finance or credit. Weak contracts also lead parties to rely more on relational contracting: where courts are weak, reputation embedded in long-term bilateral relationships may be used as a device to ensure that contracts are enforced. This implies that firms are unwilling to interact with new contractual partners, which particularly disadvantage new entrants (Johnson, McMillan and Woodruff, 2002). Furthermore, weak contractual enforcement may also reduce entrepreneurial activity by high-skilled individuals (Ardagna and Lusardi, 2008, 2009). Finally, weak contract enforcement proves to be associated with low relationship-specific investments (Nunn, 2007) which can further constrain start-ups' post-entry growth prospects.

2.3. Which industries are the most exposed to finance, bankruptcy, and contract enforcement policies?

The basic intuition underlying the empirical methodology used in this paper is that some industrial sectors or some groups of firms are naturally more exposed than others to the effect of certain national policies or framework conditions, due to their intrinsic technological characteristics. For instance, Rajan and Zingales (1998) estimate the impact of financial development by investigating whether industries that are more dependent on external finance grow relatively faster in countries with more developed financial markets, relative to industries less dependent on external finance.

A direct corollary is that policies that have been traditionally thought of as "horizontal" have heterogeneous impacts on firms depending on their activity: each policy, even if neutral in its design, is implicitly targeting more intensely a specific group of firms being more exposed to the policy for their own "technological" characteristics. For example, R&D support would be of very little utility to firms not performing any formal R&D, while it would have much greater impact in R&D-intensive industries such as pharmaceuticals.

Three different sector-exposure variables are used in this paper to define which industries are more exposed to the national polices and framework conditions described above: financial input intensity, volatility, and growth dispersion. Financial input intensity is a close substitute for similar variables that have already been widely used in the literature. The second two variables – growth dispersion, which describes the employment growth gap between top and bottom performers, and average firm-level volatility, which captures the firm-level time variation in employment growth – are used less frequently in this kind of analyses, and are directly sourced from the new DynEmp v.2 database. The general characteristics of the three variables are described below, while their detailed calculation and data sources are described in the Data section.

Financial input intensity measures the degree to which a sector relies on financial input. It can be interpreted as a proxy for external financial dependency, similar to the measure developed in Rajan and Zingales (1998). Firms and industries with higher finance input intensity are expected to be more exposed to policies that are directly or indirectly affecting the easiness of access to external financial resources.

Volatility measures the variability of firm-level employment growth over time. This is an important sector characteristic, as there is evidence that volatile sectors have higher growth potential (in the next session this is discussed in more detail). It will be shown that this holds true in the DynEmp v.2 database, although with some relevant differences across countries. At the same time, the data show that volatility is also associated with lower survival rate at the sectoral level. This suggests that volatility translates into higher risk for businesses, and given that many policies are either explicitly targeted at lowering risk (e.g. subsidised finance), or, on the contrary, are implicitly imposing an extra cost to risk (e.g. poor contract enforcement or inefficient bankruptcy procedures), firms in volatile sectors might be particularly exposed to national policies. In turn, these policies are likely to have a more significant impact on new firms, which do not yet dispose of the internal resources necessary to operate in a risky environment.

Growth dispersion is calculated as the difference in average employment growth between the top and the bottom performers in the sector. If volatility measures the within-firm variability in employment growth, growth dispersion measures the between-firm variability in the same variable at a point in time. It is computed as the difference between the average employment growth rate of firms at the top and the bottom 10% of the growth distribution, respectively. Industries in which growth dispersion is higher are industries in which a higher rate of job reallocation occurs, with many firms growing and many shrinking fast. Therefore, sectors with high growth dispersion can be sectors in which successful entrants can grow more than in less dynamic industries, to the extent that national policies and framework conditions are not hampering an efficient reallocation of resources and thus upscaling of successful ventures. Furthermore, it

is now an established fact that, among start-ups and young firms, a small number of fast-growing firms contributes disproportionately to job creation (e.g., Calvino, Criscuolo, and Menon, 2015). Therefore, as argued in Haltiwanger et al. (2015), high dispersion in growth rates and positive skewness[7] are associated with a high propensity to have high-growth firms in an economy, and therefore with faster employment growth.

However, higher dispersion also means a more turbulent business environment and higher risk for the firm. Volatility and dispersion therefore capture rather similar sector characteristics and are indeed significantly correlated. Nevertheless, the two variables capture different and complementary components of the uncertainty faced by the start-ups. While volatility proxies the degree of uncertainty over a specific time horizon that has to be managed *within* the firm, dispersion proxies the *between*-firm risk that has to be dealt with by investors. With a given and low rate of volatility for different firms over time, there can still be considerable dispersion across firms. And for a given and low rate of dispersion across firms, there can still be considerable firm employment growth volatility.

3. Data

This section illustrates the database used for the empirical analysis, which is obtained from the combination of a number of different datasets from different sources. The core component is the recently collected DynEmp v.2 database, which is described in detail in subsection 3.1 and 3.2, while subsections 3.3 and 3.4 describe the policy indicators and the sector-exposure variables used in the econometric analysis.

3.1. The DynEmp v.2 database

The data used in this paper are the intermediate outcome of the on-going second data collection round within the DynEmp project, which is led by the OECD Directorate for Science, Technology and Innovation, with the support of national delegates and national experts in OECD member and non-member economies.

The DynEmp project is based on a distributed data collection exercise aimed at creating a harmonised cross-country micro-aggregated database on employment dynamics from confidential micro-data, where the primary sources of firm and establishment-level data are national business registers. The project is supported by a network of national experts who run common Stata routines developed centrally by the OECD DynEmp team on the confidential micro-data to which they have access. The experts also implement country-specific disclosure procedures in order to ensure that confidentiality is respected.[8]

A number of significant extensions are implemented in DynEmp v.2, with respect to the previous wave of the project, DynEmp Express. Firstly, the DynEmp network has been expanded to include several additional economies (e.g. Australia, Canada, Chile, Costa Rica, Denmark, Germany, Ireland, Korea, Mexico, Slovenia and Turkey).[9] Secondly, DynEmp v.2 now includes a more disaggregated analysis of transition dynamics allowing for the investigation of start-ups' dynamics in greater depth, and to follow cohorts of entrants after three, five and seven years after entry (this analysis is reported in so-called "transition matrices"). Thirdly, the dataset allows for a more granular analysis at sector level, as the micro-data are now aggregated up to two-digit sectors, rather than just to three macro-sectors, as had been the case in the DynEmp Express database. Furthermore, a number of additional variables have been included in the software output, such as employment growth volatility; average growth rate; gross job creation by the top 10% of the employment growth distribution (these variables are included together with information on job flows in the "flow databases"). Finally, the routine includes a number of "distributed regressions", i.e. regressions conducted at the micro-level within each separate country following the same econometric model, estimation method and over the same time period. These estimates are included in the output,

allowing for further investigation of a number of dimensions (such as exit probabilities over the recession) and for a policy analysis of the factors affecting the size distribution, such as size-contingent policies.

The micro-aggregated data that are produced via the DynEmp v.2 routine by each country are carefully examined. Subsequently, a first set of data checks and analysis is sent back to the respective country experts, with whom the Secretariat engages in as many interactions as needed to clarify and solve potential inconsistencies or irregular patterns that might have been identified in the data.

The main building blocks of the data produced by the DynEmp v.2 routine can be summarized as follows: *i)* "flow datasets"; *ii)* "transition matrices"; and *iii)* "distributed regressions". Each of these elements is described in detail below.

The flow datasets contain annual statistics on gross job flows (such as gross job creation and gross job destruction, defined as the total job variation of growing and shrinking units, respectively) and on several statistical indicators of unit-level employment growth (mean, median, and standard deviation); the latter four statistics are also calculated for the turnover variable if available.

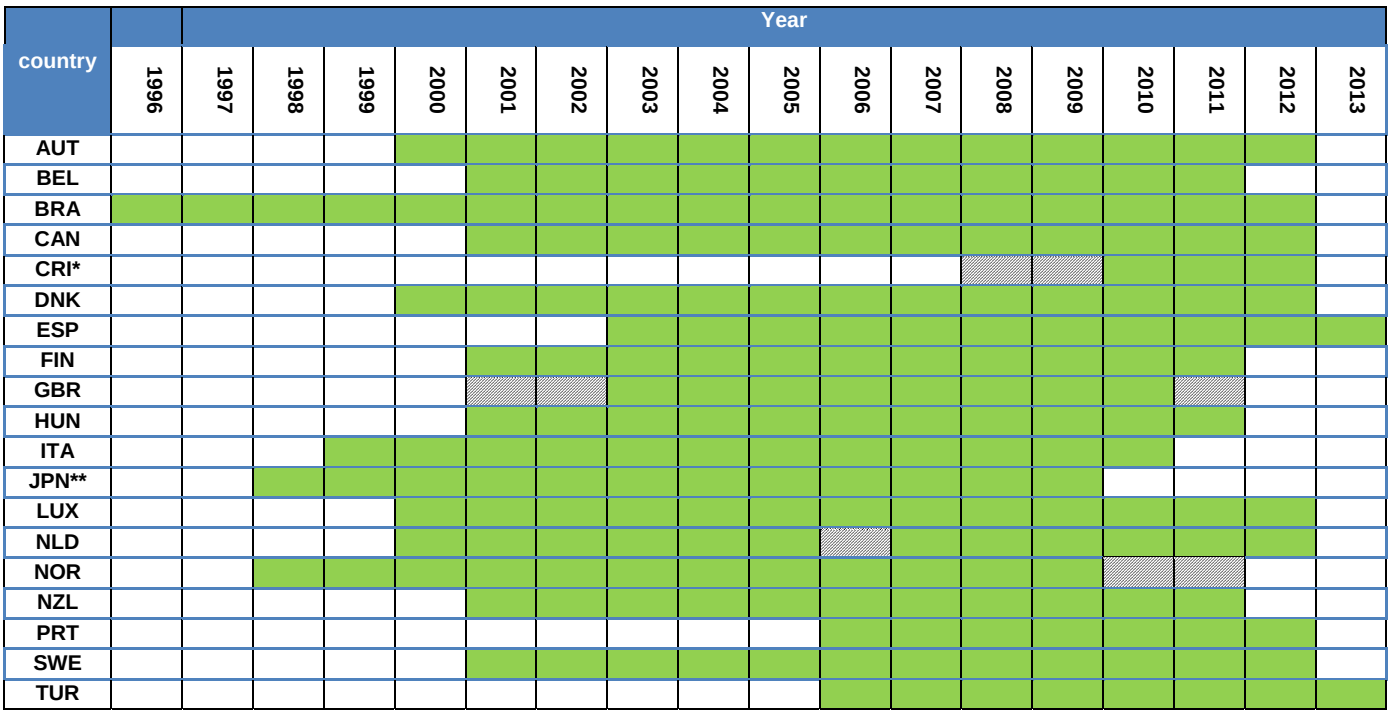
The transition matrices summarize the growth trajectories of cohorts of units from year t to year $t + j$, where t takes by default the values 2001, 2004, and 2007 and j is equal to three, five, or seven (therefore, if data are available, transition matrices are calculated for the periods 2001-2004, 2001-2006, 2001-2008; 2004-2007, 2004-2009, 2004-2011; 2007-2010; 2007-2012; 2007-2014). The matrices contain a number of statistics (number of units in the cell, median employment at t and at $t + j$, total employment at t and at $t + j$, and mean growth rate) for different combinations of age classes and size classes at time t and $t + j$, and additional statistics on the dynamics of high-growth units.

DynEmp v.2 is also collecting three sets of distributed regressions outputs. The first set of ordinary least squares (OLS) regressions focus on employment growth dynamics. The second set of regressions estimates (by means of a Linear Probability Model) exit probabilities. These regressions control for two-digit industries specificities and for different age/size effects, with an additional focus on pre- versus post-crisis patterns. The third set of regressions is aimed at describing the firm or establishment growth distribution, and at identifying potential significant discontinuities in these distributions, with the objective of ultimately investigating the link to the institutional and regulatory environment.

At the time of writing, 19 countries have been successfully included in the DynEmp v.2 database (namely, Austria, Belgium, Brazil, Canada, Costa Rica, Denmark, Finland, Hungary, Italy, Japan, Luxembourg, the Netherlands, Norway, New Zealand, Portugal, Spain, Sweden, Turkey, and the United Kingdom).[10] Data at firm-level are available for all of the above-mentioned countries. For most countries, the time period between 2002 and 2011 is covered. For Costa Rica, Portugal and Turkey fewer years are available, while the time horizon for Austria, Brazil, Denmark, Norway and Sweden is longer. For Costa Rica, no transition matrix is available due to the limited time span over which the source data are available. For Japan, data are limited to the manufacturing sector. For Canada, only a limited portion of the database is available at the time of writing. Details about temporal coverage by country are summarized in Table 2.

As emphasised by Criscuolo, Gal and Menon (2014a), the advantages of using harmonised micro-aggregated data from business registers for the study of business employment dynamics are manifold. First of all, the different channels of employment variation can be identified separately, distinguishing between gross job creation and gross job destruction, and between the extensive (firm entry and exit) and the intensive margins (post-entry growth). Furthermore, the role of firm age and size can be examined. Finally, each of these elements can be compared across countries, sectors and over time.

Table 2. Temporal coverage of the DynEmp v.2 database over time by country



Notes: temporal coverage of the DynEmp v.2 database at the time of writing. Years for which annual flow data are available are coloured. Analysis based on flow data excludes the first available year, since most job flows statistics require two consecutive periods to be computed. Shaded cells correspond to years that have been excluded from the analysis due to issues in the underlying data. See Annex A for detailed information on data sources. *For Costa Rica no transition matrix is available due to the limited time extension of the source data. **For Japan data refer to the manufacturing sector only.

Source: OECD DynEmp v.2 database. Data for some countries are still preliminary.

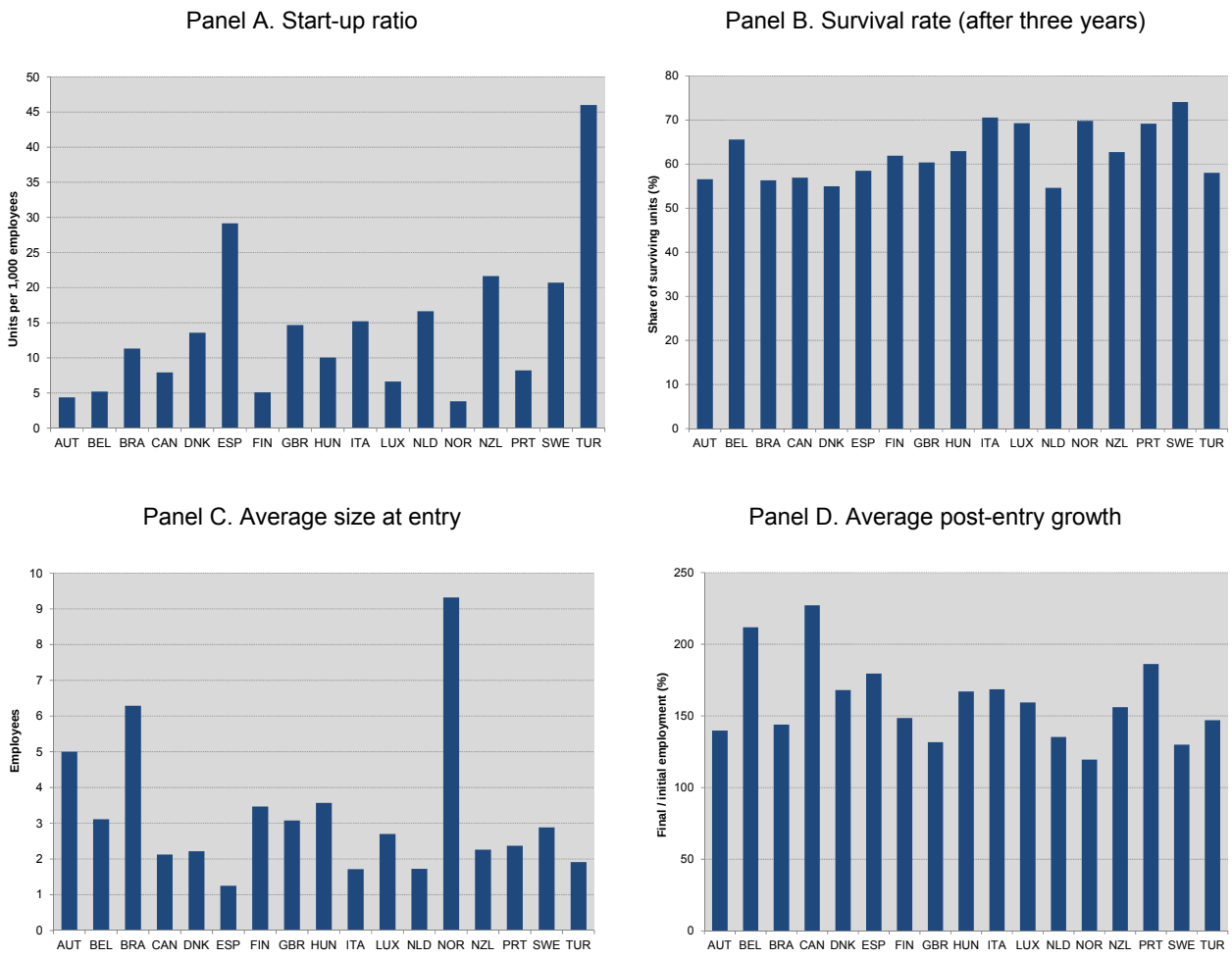
Measuring entrepreneurship and its economic effects in terms of job creation is not an easy task and appropriate data, taking into account the age and not only the size of businesses, are necessary. Furthermore, very few databases allow researchers to follow cohorts of firms (or plants) over time, despite the wide recognition that this is crucial when studying business dynamics, especially in the case of entrants (see for instance Bartelsman, Scarpetta and Schivardi, 2005). Even fewer databases combine a cohort approach with a detailed sector disaggregation. The DynEmp v.2 database provides a unique tool for this type of analysis.

3.2. Start-ups and employment: descriptive evidence

Calvino, Criscuolo and Menon (2015) set up a comprehensive analytical framework to analyse start-up dynamics across countries. Namely, they propose a new decomposition in which the contribution of start-ups in terms of new jobs to the existing workforce[11] is expressed as a combination of four different elements: start-up ratio, average size at entry, survival rate and average post-entry growth (see Section 4.2 for further details on the definition of these variables). Figure 1 separately reports each element of this decomposition.[12]

Figure 1 highlights a significant degree of variation in the elements of the growth decomposition across countries, with the exception of survival rate (in Panel B) which exhibits more uniform dynamics across the economies examined. The variation in start-up ratio, average size at entry and post-entry growth across countries translates into a heterogeneous contribution of start-ups in terms of new jobs to the existing labour force (see also Calvino, Criscuolo and Menon, 2015, p. 12).

Figure 1. Growth decomposition



Notes: the graph illustrates the four elements of the growth decomposition. Panel A: start-up ratio, expressed as total number of entering units (entrants) over total employment (in thousands); Panel B: survival share of entrants, expressed as number of entering units surviving over total number of entrants per cent; Panel C: average size of surviving entrants expressed as total employment of surviving entrants over number of surviving entrants; Panel D: ratio between total employment at $t + 3$ over total employment of surviving entrants. Figures report the average for different time periods t = 2001, 2004 and 2007, conditional on their availability. Sectors covered are: manufacturing, construction, and non-financial business services. Firms reporting missing employment in the entry year are excluded from the sample. Owing to methodological differences, figures may deviate from officially published national statistics.

Source: Calvino, Criscuolo, and Menon (2015) and OECD DynEmp v.2 database. Data for some countries are still preliminary.

Previous work also highlighted that only a tiny proportion of surviving start-ups experience very fast growth (Criscuolo, Gal, and Menon, 2014b; Anyadike-Danes et al., 2014). This is confirmed by the DynEmp v.2 database: Figure 2 analyses the post-entry patterns of micro-entrants,[13] classifying them according to their size class five years later (or in the "exit" group if they did not survive). From Panel A, which presents the figures in terms of number of units, it is evident that most micro start-ups either remain stable (i.e., at the end of the period they are in the same size class in which they were at the beginning of the period) or exit the market. In every country, the number of micro start-ups moving to a higher size class at the end of the period is extremely small – on average around 3% and never more than 8%. The graph also shows that, in most economies the number of surviving micro start-ups is higher than the number of exiting units. These patterns however radically change if, rather than looking at firms, one focuses on jobs.

Panel B in Figure 2 illustrates post-entry dynamics of micro-entrants in terms of their net job creation (defined as the difference between employment at the beginning and at the end of the five-year period). The very few micro-entrants whose size is bigger than 20 employees at the end of the five-year interval are responsible for a disproportionate share of job creation by micro start-ups in all countries. Furthermore, in most countries gross job creation by surviving micro start-ups more than compensates gross job destruction by exiting units.

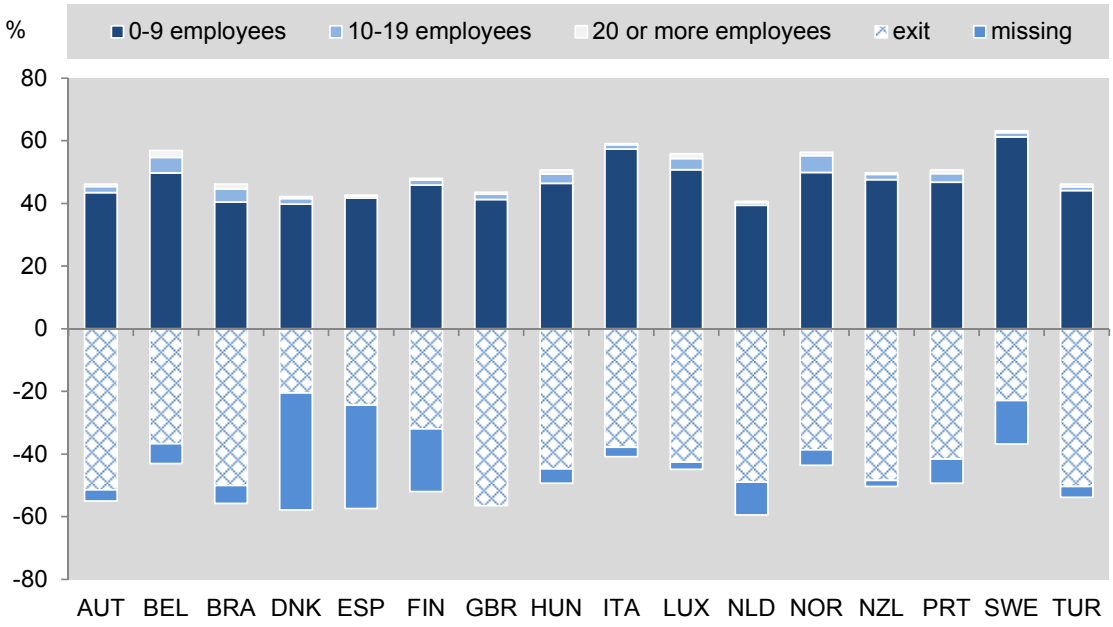
The positive contribution to job creation by the tiny proportion of start-ups that do grow is not equally distributed across their lifecycle. The fact that the most of the employment growth occurs in the crucial early years of activity seems an empirical regularity that holds across countries. Figure 3 shows that most employment growth of new entrants happens in the first two to three years of activity in all countries, despite significant cross-country differences in the extent to which start-ups continue to grow thereafter. For instance, in Canada, Spain, and Italy, little or no additional net job creation is recorded on average beyond the third year of activity of the start-up. On the opposite, in countries like Belgium, Netherlands, or Sweden, the ratio of total employment of surviving start-up after seven years (over the initial total employment at the year of entry) is significantly higher than the corresponding value after three or five years.

At the same time, a similarly strong empirical regularity is that the early post-entry years are also those in which non-surviving start-ups are most likely to be selected out of the market. Figure 4, illustrates the dynamics of the likelihood of exit conditional on age (reported on the horizontal axis), on average across countries.[14] The figure confirms that units are on average most likely to exit the market between their second and third year of activity. This holds true in most of the countries in the sample, when the same analysis is carried out separately (see Calvino, Criscuolo and Menon, 2015, p. 25-27).

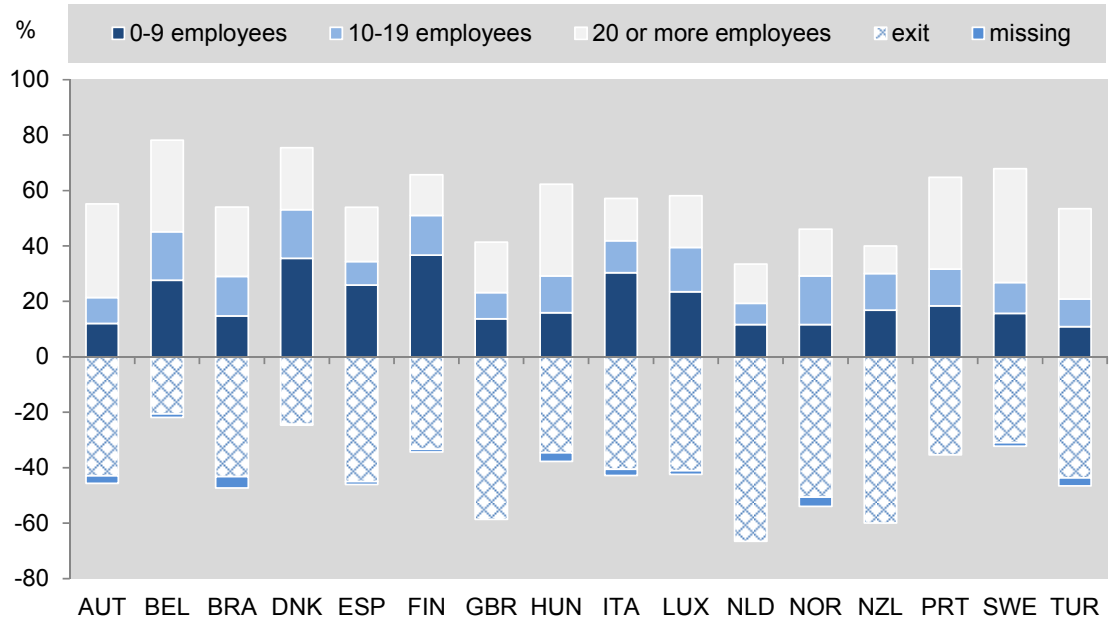
The picture presented so far shows a significant degree of variation in the extent to which different elements (start-up ratio, average size at entry, survival rate and average post-entry growth) result in the start-ups' contribution – in terms of new jobs – to the existing workforce. A tiny proportion of young firms disproportionately contribute to net job creation, suggesting that heterogeneous entrants coexist in the market and that firm growth distributions present considerable dispersion. Furthermore, the first years of activity are a crucial time span in which most market selection and most employment growth seem to occur. This points therefore to a substantial degree of firm-level volatility, especially for young firms (see also Calvino, Criscuolo and Menon, 2015 p. 30; Davis et al., 2007). The following subsection focuses in more detail on the link between volatility and growth, contextualising it in the framework of this study.

Figure 2. Focus on micro-entrants: stable vs. growing vs. exiting

Panel A. Share of units in all micro-entrants



Panel B. Contribution to total net job creation

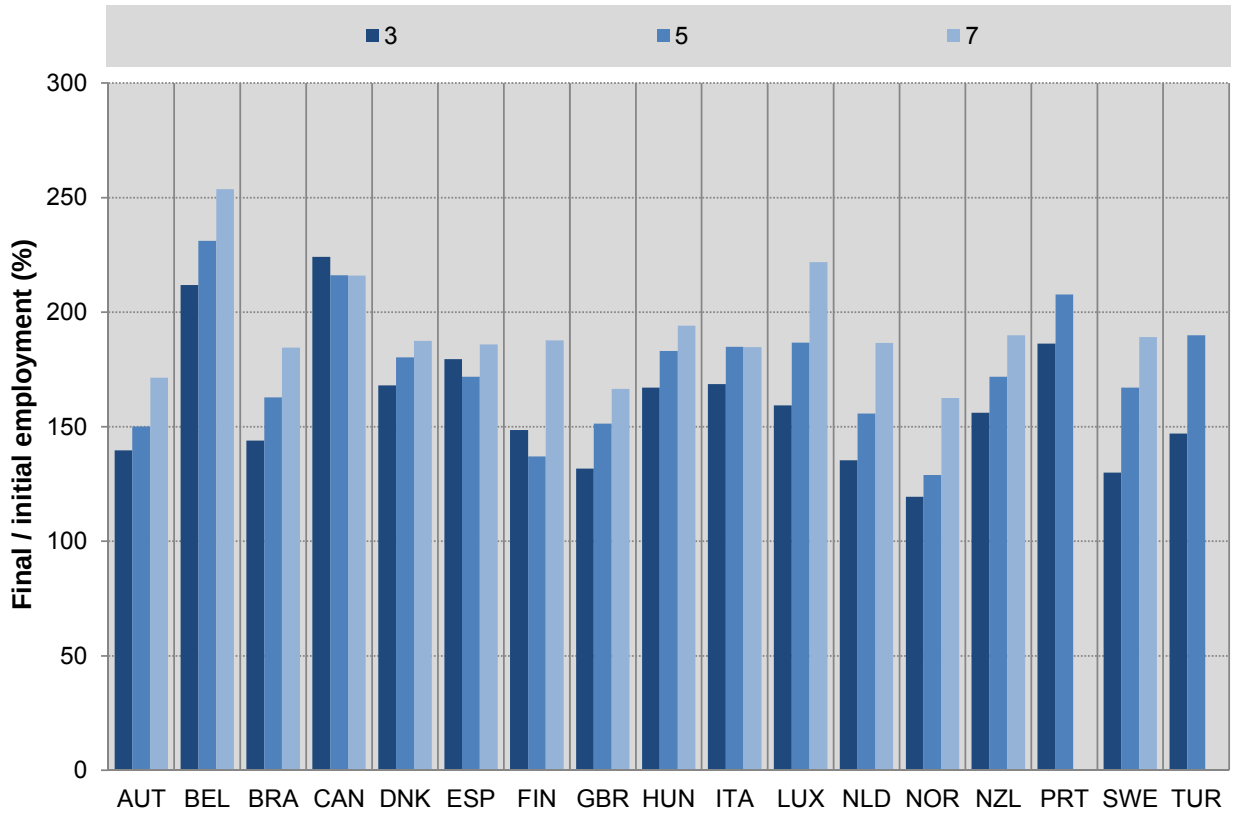


Notes: Panel A represent the share (in terms of number of units) of micro-entrants (0-9 employees) by size class at time *t* + *5*. Panel B represents the contribution to net job creation (defined as net job creation by the group over total net job creation of micro-entrants) for micro-entrants (0-9 employees) by size class at time *t* + *5*. Size classes are aggregated as follows: 0-9 (stable), 10-19 and 20+ employees (growing), exit (shrinking) and units for which the size class at time *t* + *5* is missing. Figures report the average for different time periods *t* = 2001, 2004 and 2007, conditional on their availability. Sectors covered are: manufacturing, construction, and non-financial business services. Canada is not reported due to limited data availability. Owing to methodological differences, figures may deviate from officially published national statistics.

Source: Calvino, Criscuolo, and Menon (2015) and OECD DynEmp v.2 database. Data for some countries are still preliminary.

Figure 3. Ratio of employment levels of surviving firms at 3, 5, and 7 years, relative to initial year

Country average of final over initial employment for initial years 2001 and 2004, surviving entrants

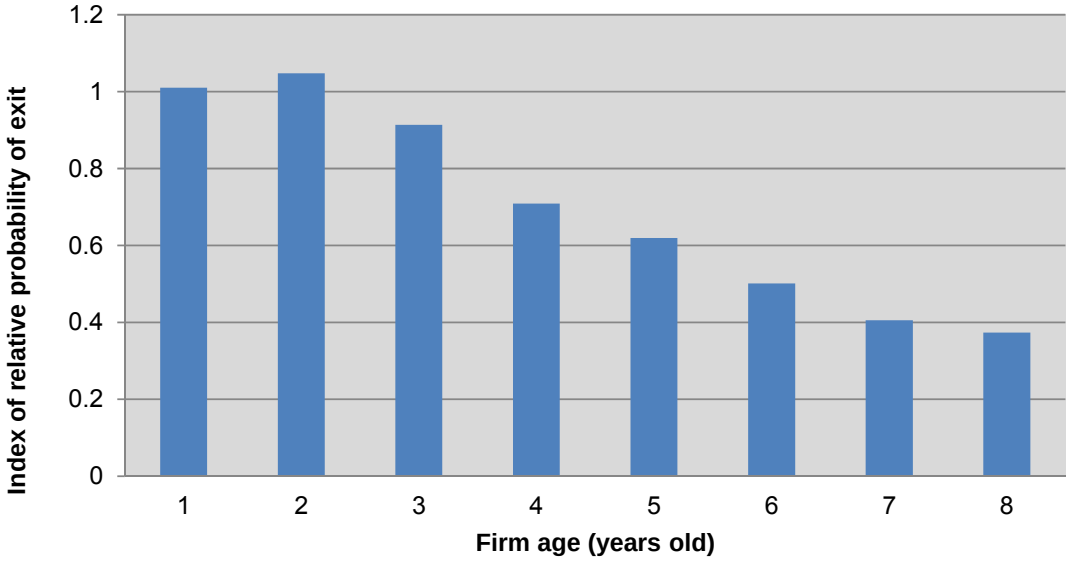


Notes: the graph shows the ratio between employment at time $t + j$ and employment at time t of surviving entrants. Figures report the average for different time periods t = 2001 and 2004, conditional on their availability (cf. Table 2 reporting limited time coverage for Portugal and Turkey). Sectors covered are: manufacturing, construction, and non-financial business services. Each of the time lags j = 3, 5, 7 is reported separately. Owing to methodological differences, figures may deviate from officially published national statistics.

Source: Calvino, Criscuolo, and Menon (2015) and OECD DynEmp v.2 database. Data for some countries are still preliminary.

Figure 4. Relative probability of exit at different ages

Normalised regression coefficients (country average)



Notes: the graph reports the age coefficients of the exit "distributed regression" (which has as response variable an exit dummy and as explanatory variables age, size, three-digit sector and year dummies). Regression coefficients are normalised by country (subtracting the country minimum value and dividing by the country maximum value) and then averaged out across available countries. Norway has been excluded due to ongoing checks on unusual dynamics in the underlying data. Exit regressions are not available for the United Kingdom. Firm age is reported on the horizontal axis (1 to 9 years old). Owing to methodological differences, figures may deviate from officially published national statistics.

Source: OECD DynEmp v.2 database. Data for some countries are still preliminary.

3.3. A focus on volatility and dispersion

The literature that links volatility over time – in its different declinations[15] – with economic growth at different levels of aggregation is extensive. The topic has overwhelmingly attracted the attention of macroeconomists interested in the analysis of the business cycle, but there are also many contributions based on the analysis of firm and sector-level data.

At the macroeconomic level, scholars reached a general consensus that lower average growth performance over the longer term is robustly associated with a highly volatile GDP (see for instance Martin and Rogers, 2000 and Ramey and Ramey, 1995).

However, when the data are disaggregated at sectoral level, the relationship between volatility and growth appears instead to be substantially positive (see Imbs, 2007 on a large sample of countries), suggesting that more volatile industries experience higher average growth. In particular, the most volatile sectors may be associated with higher degree of experimentation and, as shown by Imbs (2007), may command higher investments, as theoretically predicted in a mean-variance framework.[16] While these two empirical regularities may appear contradictory, Imbs (2007) reconciles the aggregate and sectoral findings, showing analytically and empirically that the sign of the relation at sectoral level can easily be different from the sign at aggregate level.[17]

At the microeconomic level, many contributions devote attention to the secular trends of growth volatility (see for instance Davis et al., 2007, Comin and Mulani, 2006 and Comin and Philippon, 2006) or to the extent to which volatility is correlated to aggregate fluctuations (see for instance Carvalho and Gabaix, 2013 and Gabaix, 2011). Some of these contributions characterise the variability of business growth rates by using both volatility (within firm over time) and dispersion (between firms at given points in time) measures and show that, while capturing different aspects of business dynamics, the two measures track each other relatively well in the United States (Davis et al., 2007). Few studies link the role of policies or institutional settings to industry-level volatility dynamics. Notably, Cuñat and Melitz (2012) provide theoretical and empirical evidence for a large sample of countries that suggests that the exports of economies with more flexible labour regulations tend to be concentrated relatively more in sectors with higher volatility.

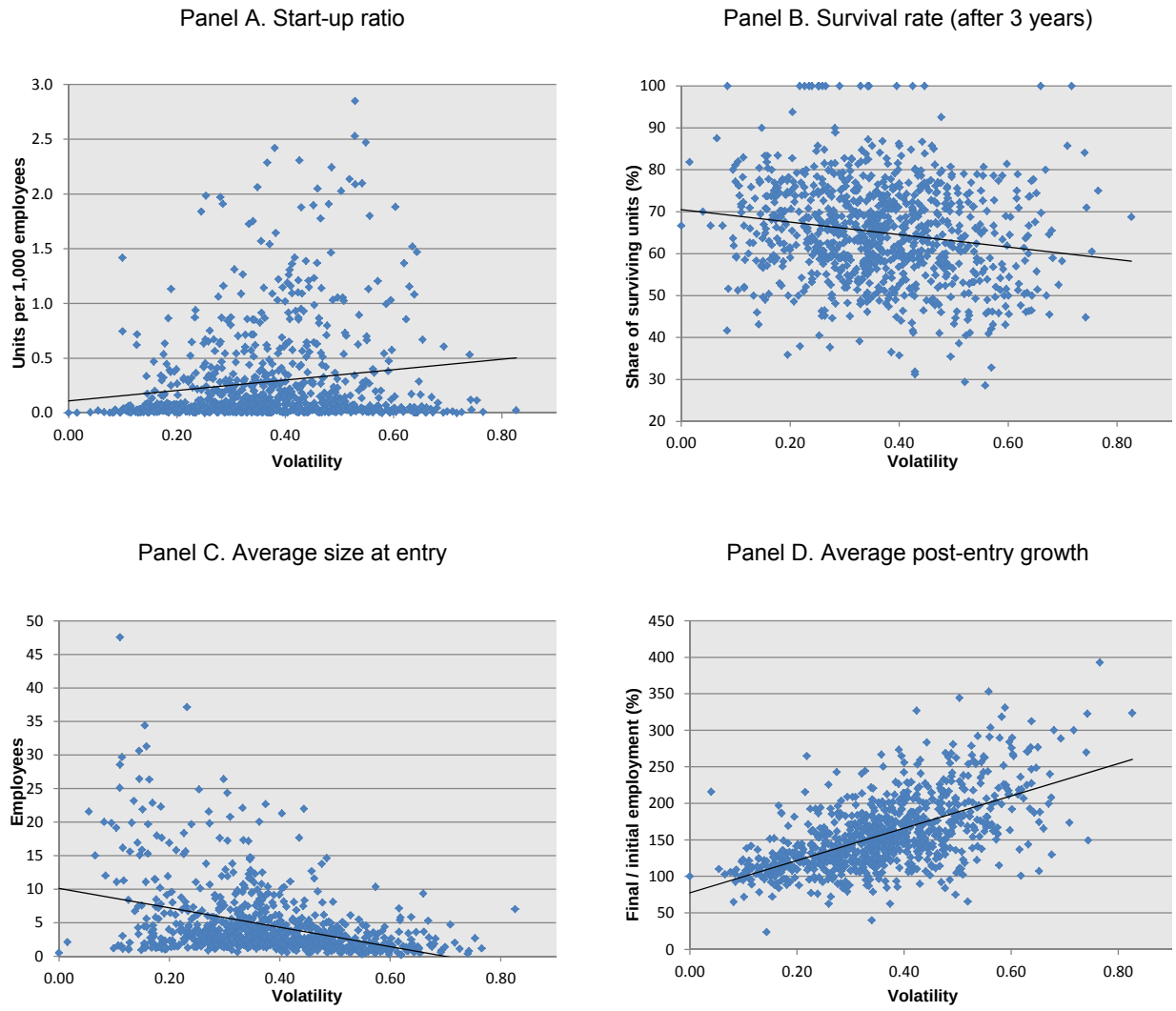
Analysis based on the DynEmp v.2 database tends to confirm the existence of a positive link between employment growth and employment growth volatility of surviving firms.[18] In particular, Figure 5 illustrates the relationship between volatility and each element of the previously described growth decomposition at two-digit sector level, pooling together surviving entrants from all countries in the database. Panel D (in Figure 5) confirms that surviving entrants in more volatile industries tend to grow more. However, most volatile industries appear also to be linked with more selection (see Figure 5, Panel B, which shows a negative relationship between survival share and volatility of surviving entrants). Furthermore, volatile sectors seem to be associated with higher entry (in terms of start-up ratio, see Figure 5, Panel A) and lower average size at entry (see Figure 5, Panel C).

In the case of incumbents, the growth-volatility link exhibits a high degree of cross-country heterogeneity with unconditional sectoral correlations being statistically insignificant or negative in few countries at a particular point in time (see Figure B.1 in Appendix B). In particular, some countries (e.g. Spain and New Zealand) tend to show a flatter – or even negative – slope, while others (e.g. Belgium, Sweden, the United Kingdom) show a clear positive association.

Despite these findings, the link between employment growth and volatility at the two-digit sectoral level – controlling for year, country, sector and age-specific factors in the pooled sample – is positive, statistically significant and generally robust, consistent with the results of Imbs (2007), as shown by the estimates reported in Table B.1 in Appendix B.[19]

Interestingly, analysis based on DynEmp v.2 confirms a certain degree of correlation between employment growth volatility and dispersion,[20] especially in the case of entrants (see Table B.2 in Appendix B). This is also evident when focusing on the rankings of two-digit sectors by average employment growth volatility and average employment growth dispersion, presented in Appendix B together with rank correlations (see Table B.3). A number of two-digit sectors in non-financial business services (including Telecommunications and Scientific R&D) are on average ranked at the top both in terms of volatility of entrants and dispersion, despite being less volatile when looking at incumbents (where Advertising and Market Research is ranked at the top). On the other hand, two-digit sectors in manufacturing are generally ranked lower.

Figure 5. Volatility and growth decomposition



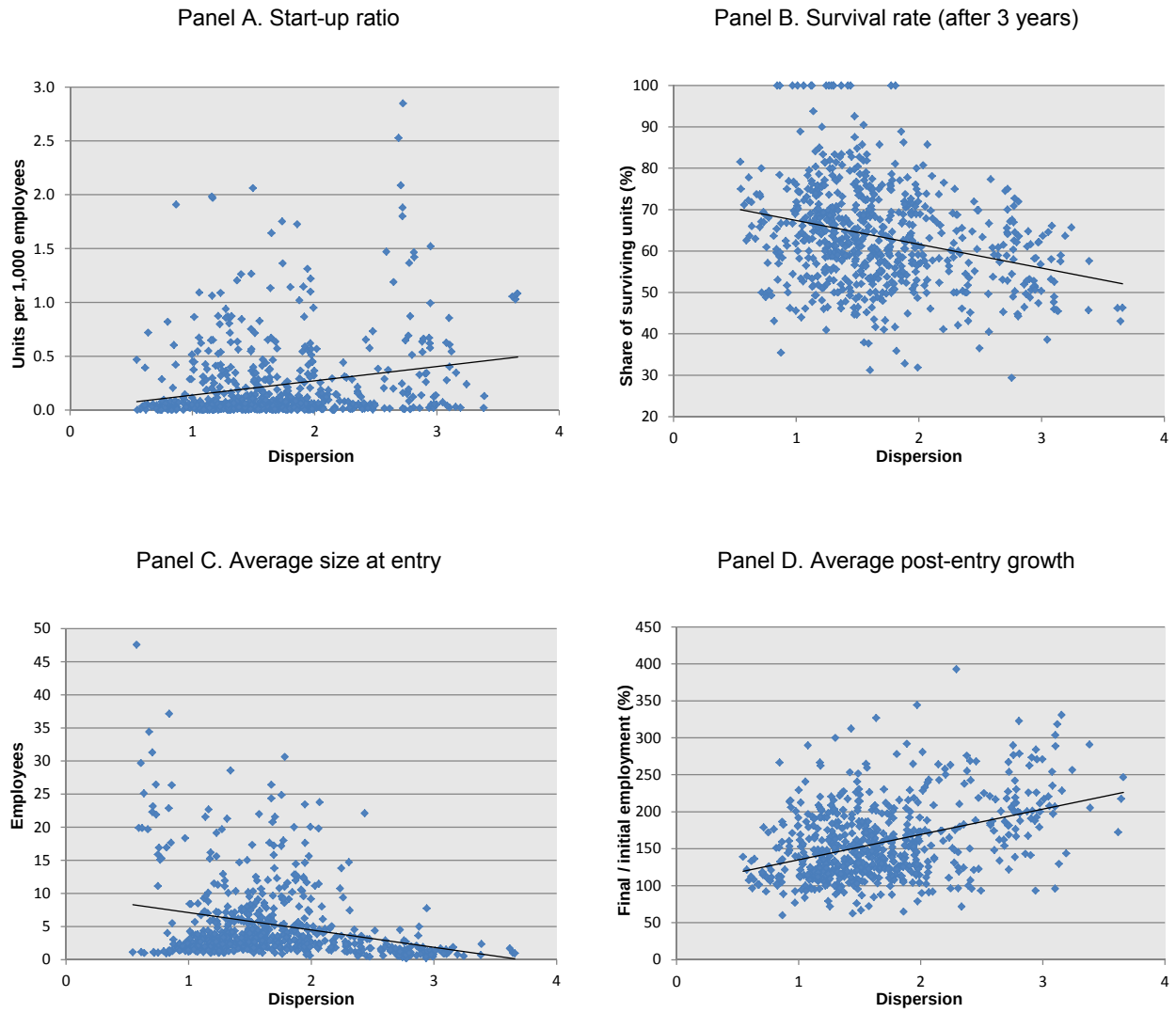
Notes: the graph illustrates the relationship between employment growth volatility and each of the four components of the growth decomposition. Panel A: start-up ratio, expressed as total number of entering units over total employment (in thousands); Panel B: survival share of entrants, expressed as number of entering units surviving over total number of entrants per cent; Panel C: average size of surviving entrants expressed as total employment of surviving entrants over number of entrants; Panel D: ratio between total employment at *t* + *3* over total employment of surviving entrants. Each dot in the scatter represents a two-digit sector. Available years for each country are pooled together (*t* = 2001, 2004 and 2007). A linear fit is superimposed to the graphs. Outliers based on the distribution of each variable (filtering method: 1.5*interquartile range) are excluded from the graph. However, qualitatively similar patterns hold when outliers are included. The sample of countries included corresponds to the one used for the econometric analysis. Owing to methodological differences, figures may deviate from officially published national statistics.

Source: OECD DynEmp v.2 database. Data for some countries are still preliminary.

Figure 6 illustrates the relationship – at the two-digit sector level – between each component of the growth decomposition and dispersion. In particular, Panel D (in Figure 6) highlights a positive relationship between post-entry growth and dispersion. This suggests that industries with higher growth dispersion – which are characterised by more churning – are industries in which successful entrants are able to attract resources more easily.

Differently from volatility, in the pooled sample there is not a clear association between growth dispersion and employment growth of surviving *incumbents*. This suggests that growth dispersion is specifically associated with *start-ups'* growth (see Panel D Figure 6). A detailed characterisation of these patterns is beyond the scope of this paper, and it is left for future empirical research based on the DynEmp v.2 database.

Figure 6. Dispersion and growth decomposition



Notes: the graph illustrates the relationship between employment growth dispersion and each of the four components of the growth decomposition. Panel A: start-up ratio, expressed as total number of entering units over total employment (in thousands); Panel B: survival share of entrants, expressed as number of entering units surviving over total number of entrants per cent; Panel C: average size of surviving entrants expressed as total employment of surviving entrants over number of entrants; Panel D: ratio between total employment at *t + 3* over total employment of surviving entrants. Each dot in the scatter represents a two-digit sector. Available years for each country are pooled together (*t* = 2001, 2004 and 2007). A linear fit is superimposed to the graphs. Outliers based on the distribution of each variable (filtering method: 1.5*interquartile range) are excluded from the graph. However, qualitatively similar patterns hold when outliers are included. The sample of countries included corresponds to the one used for the econometric analysis. Owing to methodological differences, figures may deviate from officially published national statistics.

Source: OECD DynEmp v.2 database. Data for some countries are still preliminary.

3.4. Policy variable definitions

As explained above, this paper focuses on three policy areas: bankruptcy regulation, contract enforcement and access to finance. Ten different variables are defined in order to capture different aspects of the policy environment and framework conditions across different countries.[21] It is worth emphasizing, however, that collapsing a national policy environment into a few quantitative indices is a formidable challenge. This constitutes probably the most important limitation of this study and the caveat should be kept in mind when considering the econometric results. The development of new policy indicators and the refinement of the existing ones would be extremely useful for policy-relevant economic research but is beyond the scope of this paper.

The efficiency and effectiveness of corporate bankruptcy law are measured with a variable taken from the World Bank Doing Business database ("resolving insolvency" section), measuring the time needed to solve an insolvency case. The variable relates to an identical insolvency case (a limited liability company running a hotel) in different countries.[22] Information is collected from a questionnaire filled in by local insolvency practitioners and verified through a study of laws and regulations as well as public information on bankruptcy systems. The time needed to solve the insolvency case negatively correlates with the general level of efficiency and effectiveness of the bankruptcy regulation in a country. The variables refer to the period 2001-11.

Two proxies are used for contract enforcement. The first one is a measure of the time needed to solve a dispute; the idea behind the use of this proxy being that the longer it takes to resolve a dispute over a contract, the less effective is the enforcement of that contract. Indeed, the timely resolution of disputes is just one of the dimensions on which the performance of a judicial system, hence its ability to ensure contract enforcement, can be measured (other dimensions include fairness and predictability of judicial decisions). The variable is sourced from the World Bank Doing Business database and refers to the period 2001-11. The second proxy is an indicator of the overall degree of court specialisation. In an increasingly complex business environment, specialisation is an important performance-enhancing factor, as it enables judges to acquire detailed knowledge of a given area of law and to familiarise themselves with related technical issues. The indicator is sourced from a new OECD dataset described in Palumbo et al. (2013). This variable is not available for Brazil and is only available for the 2010-11 time period.

Finally, seven variables are used in the access to finance area. To measure the extent of policy intervention in a country, two variables taken from Wilson and Silva (2013) are used. The first measures the number of seed and early-stage policies introduced in a given country that are "tax-based", while the second corresponds to the number that are "equity-based". Tax instruments largely affect market participants by altering the marginal costs of and returns to their investment. Some affect the entrepreneurs, by lowering taxation with loss-carry forward provisions that are sometimes granted to 'young innovative companies' in order to defray the tax burden in their first years of activity. However, given that most young firms do not make profit, their effectiveness can be limited. Other tax instruments affect investors by granting reduction on capital gains ("back-end" tax instruments), so that they operate through the supply of entrepreneurial funds. Equity instruments, on the other hand, can also be targeted to both suppliers and demanders of entrepreneurial finance, and may directly be deployed as share capital of entrepreneurial companies, through investments made by public venture firms or other public agencies. They could potentially be more effective for nascent businesses as they are "profit-neutral".

The third finance variable is a measure of the availability of venture capital (VC). The indicator is collected by the World Economic Forum (WEF) through a questionnaire filled in by economic operators in each country. The answers are classified on a scale from 1 to 6; the higher the ranking, the more VC is perceived to be available in that particular country. The fourth variable is also collected by the WEF with the same methodology and measures the easiness of accessing bank loans. Both variables refer to the

period 2006-08. These variables are open to several criticisms as are subjective indicators and are likely to be fairly dependent on the personal judgement of the individuals interviewed.[23]

The three remaining variables are sourced from the World Bank surveys of bank regulation and supervision. One variable measures the extent to which the banking system's assets are government-owned (more precisely, the fraction of the banking system's assets held in banks that are 50% or more government-owned). La Porta et al. (2002) show that government ownership of banks has a negative impact on financial development and growth, and the indicator is also used by Aghion, Fally and Scarpetta (2007) in their assessment of the role of financial development for post-entry growth. A second variable measures the fraction of the banking system's assets that is in banks that are 50% or more foreign-owned, and it is meant to proxy the openness and the degree of competition in the banking sector. The last variable is taken from the World Bank database is an index of supervision independence, measuring the degree to which the supervisory authority is independent from the government and legally protected from the banking industry. The three variables are taken from four rounds of the survey (years 2001, 2003, 2007, 2012) and are linearly interpolated in order to obtain yearly indicators for the period 2000-11.

3.5. Sector-exposure variable definitions

As mentioned in Section 2, the econometric analysis is based on the assumption that some sectors are more exposed to the policy areas under scrutiny than others. Three different variables are used to proxy for the sector-specific exposure to policies: financial input intensity, employment growth volatility, and employment growth dispersion. In the following, these variables are defined in more detail.

Ideally, in this kind of difference-in-difference analyses (see Section 2.3) the sector-exposure variables should describe and rank industries only according to technological or structural features without being affected by national policies and framework conditions. This is not straightforward: for example the growth volatility of a particular sector in a given country is going to be affected by national policies and framework conditions of that given country, thus biasing the results of the analysis. Therefore, the sector variables are relative to one or more benchmark countries which are not included in the sample. Alternatively, the variable is calculated on the average of the values across all countries except the country for which the variable refers to. This should eliminate the risk that the estimated relationship might be driven by a causal link going from sector features to national policies, rather than by policies affecting sector outcomes (i.e. endogeneity driven by reverse causality).

Financial input intensity is defined as the total costs of financial inputs (i.e. inputs supplied by the finance industry) over value added, using input-output tables for the United States (maintained by the Bureau of Economic Analysis, year 2008). This variable has been used in a similar empirical exercise by Bravo-Biosca, Criscuolo, and Menon (2013) and provides comparable – albeit more precise – results than more traditional measures of financial dependency, including the index proposed by Rajan and Zingales (1998) based on cash-flow.

Employment growth volatility is taken from the DynEmp v.2 database (transition matrices).[24] The value is calculated on average for all countries included in the database – excluding the one for which the measure is calculated – for the 2001-06 and 2004-09 periods.

Employment growth dispersion is also taken from the DynEmp v.2 database (yearly flow data), and is calculated as the difference in average employment growth between the firms at the top and bottom 10% of the employment growth distribution. Similarly to volatility, the value is taken on average for all the countries included in the database excluding the one for which the measure is calculated. The period covered is 2001-2011.

4. Econometric analysis

This section discusses the theoretical hypotheses and the methodology of the econometric analysis. The granularity of the dataset – namely the availability of data on both entrants and incumbents at country, year, and two-digit sector level – allows an econometric exercise that is remarkably precise. In particular, joint sectoral *and* country variations can be exploited to develop a so-called "difference-in-differences" estimation strategy, in which country- and sector-level confounding factors can be simultaneously controlled for. Improving on previous analyses, with the DynEmp v.2 database it is possible to disentangle how policies shape the growth pattern of entrants with respect to incumbents, within each country-sector-year combination. As mentioned above, this is potentially very informative, as so far very little is known on the differential impact of national policies on new firms, as compared to established businesses.

The two-digit sector database that has been validated for the econometric analysis at the time of executing the regression estimates includes the following countries: Austria, Belgium, Brazil, Denmark, Finland, Hungary, Japan, Italy, Luxembourg, the Netherlands, New Zealand, Portugal, Spain, Norway, Turkey, Sweden, and the United Kingdom.

4.1. Empirical strategy

The econometric analysis is the natural follow-up of a companion working paper (Calvino, Criscuolo, and Menon, 2015) which illustrates how the net job contribution of surviving start-ups can be decomposed into four components: the start-up ratio, the average size of firms at entry, the survival rate, and the average growth rate of survivors. These together with the overall net job contribution of start-ups will be the main dependent variables.

The empirical strategy will follow a difference-in-difference approach in the spirit of Rajan and Zingales (1998) and has already been applied in a number of OECD policy reports (e.g., Bravo-Biosca, Criscuolo and Menon, 2013). As mentioned above, the basic intuition is that some industrial sectors or some groups of firms are more exposed than others to the effect of certain national policies due to their technological characteristics.

The identification of the "impact" of (slow-changing) policies is based on this differential exposure of sectors to policy, as there are two dimensions along which the effects of the policy can vary: across sectors within the same country (because of variation in the exposure), and across countries within the same sector (because of differences in the policy setting).

Operationally, the model to be estimated is the following:

$$Y_{cst} = \propto + \beta * Pol_{ct} * Exp_{st} + \theta_t + \kappa_c + \gamma_s + \epsilon_{cst} \qquad (1)$$

where a full set of country dummies and of two-digit sector dummies are included; *c* indexes countries, *s* sectors, and *t* time periods. *Pol* is the national policy variable, and *Exp* is the sectoral exposure variable; θ, κ, and γ are time, country, and sector dummies, respectively. The unit of observation is the country-sector-year combination.

As the econometric set-up includes five different dependent variables from the same database, it is plausible to assume that the error structures of the five models are not mutually independent. Therefore, the models are estimated in a system of Seemingly Unrelated Regressions (SURs) following the method developed by Zellner (1962).

All regressions include a full set of sector, country, and time period dummy variables, as typical in the Rajan-Zingales "difference-in-difference" approach. This enables the partialling out of all factors that are:

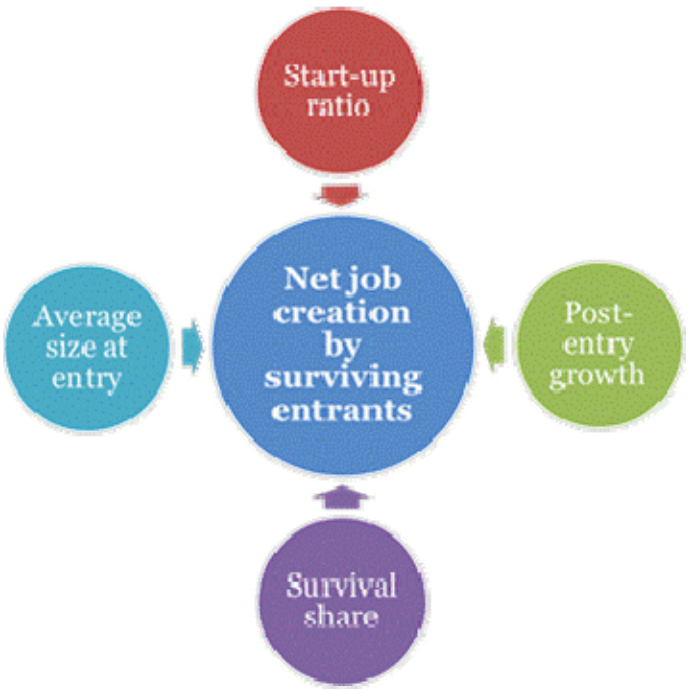
country-specific and do not vary across sectors and time; sector-specific that do not change across time and countries; time-specific that do not change across sectors and countries.

4.2. Dependent variables

As mentioned above, the dependent variables are directly derived from Calvino, Criscuolo, and Menon (2015). Using the same database as in this study, the authors show that the contribution of new firms in terms of new jobs to the existing workforce can be expressed as a combination of four different elements (Figure 7):

- The start-up ratio: measured as the number of entrants relative to the country's total employment.[25]
- The survival share: calculated as the number of units that survive until or beyond the third year of life over the total number of starting units.
- The average size of firms at point of entry: measured as the average number of employees for entrants.
- The average post-entry growth rate of survivors: calculated as the final over initial employment ratio of surviving entrants (available data allows for lags of three, five, or seven years).

Figure 7. The components of start-up contribution to employment creation



Source: Calvino, Criscuolo, and Menon (2015).

The first dependent variable is therefore the contribution of new firms in terms of new jobs (net job contribution by surviving start-ups, see also Section 3.2). The other four variables are the ones listed above.[26] The coefficient estimates from the first variable can therefore be interpreted as a summary result, while the estimates from the regressions with the other four variables as dependent variables try to shed light on the underlying mechanisms that can explain the overall results.[27]

With the last two dependent variables – survival share and post-entry growth – two additional controls are included amongst the explanatory variables in the regression model: namely average size at entry and start-up rate (i.e. the dependent variables in the other two regressions). This is motivated by previous findings in the literature, namely that the survival prospects tend to be better for bigger start-ups (see among the others Geroski, 1995; Audretsch and Mahmood, 1995; and Mata, Portugal and Guimaraes, 1995), and smaller firms tend to grow faster (as documented by the papers showing empirically that the Gibrat law does not hold for small firms; for a survey see Lotti, Santarelli and Vivarelli, 2009).

As the five dependent variables present a few extreme values, especially in scarcely populated sector-country pairs, all the variables are "winsorized", i.e., the top and bottom 1% of the distribution is set equal to the 99th and 2nd percentile, respectively.

In order to assess whether national policies and framework conditions play a different role for entrants and incumbents, the econometric model of equation (1) is estimated also on dependent variables defined for incumbent firms. For incumbents, start-up rates are replaced by the number of incumbent firms at the beginning of the period, and the net job contribution is calculated as the stock of employment at the end of the period (which in turn depends on employment growth over the period and on the employment level at the beginning of the period, i.e. a proxy the weight of the sector in the economy; the measure is then normalised on total employment in the whole economy at the beginning of the period, as for entrants). The other three dependent variables – employment growth, survival share, and average size at the beginning of the period – are defined exactly in the same way. By so doing, the decomposition described in Figure 7 holds also for the incumbents, which allows for a straightforward and insightful comparison of the two set of results. In particular, the comparison of the two sets of coefficients reveals whether the estimated association between a specific policy indicator and the dependent variable is statistically different for entrants with respect to incumbents.[28] Descriptive statistics are reported in Appendix B (see Table B.5).

5. Results

5.1. Main results

This section summarizes the results of the econometric analysis. It highlights the main policy messages, illustrating in particular the new findings that *i)* entrants in volatile and high-dispersion industries are more exposed to policy, *ii)* linkages with policies are much stronger for entrants than for incumbents and *iii)* survival of incumbents is generally more related to policy, relative to entrants.

It is useful to recall that the results should be interpreted as robust correlations that might be suggestive of potential underlying causal linkages, which however cannot be verified with certitude in the current econometric setting. Although the "difference-in-differences" econometric model is designed to partial-out a number of potential confounding factors, causal linkages can be inferred only with a valid and strong instrumental variable, or within an experimental setting.

In the next subsection, detailed results for surviving entrants and for incumbents are discussed. Coefficients in the tables describe the association of a particular policy to one of the components of the growth decomposition (or to the net job contribution by surviving entrants), for entrants and incumbents in sectors characterised by higher volatility (Table 3), higher growth dispersion (Table 4), and financial input intensity (Table 5). Each coefficient shown in the Table comes from an individual regression, which includes country, sector and year fixed effects; each of the ten panels in the Table also report the estimated difference between estimates based on value for incumbents and versus entrants and its statistical significance.

Results from the first set of regressions (Table 3), whose sector exposure variable is volatility, are discussed hereafter.

Net job contribution and its component in volatile sectors: entrants vs incumbents

The first main result from the econometric analysis is that start-ups in volatile sectors appear to be particularly exposed to policy. This is evident by looking at the significance of the estimated coefficients reported in Table 3: for nine of the ten policy indicators considered – all but the independence of banking supervision index – the link between net job contribution of entrants and the policy indicator is statistically significant. This is important as start-ups in volatile sectors tend also to grow more, and therefore volatile sectors can be very important for job creation. At the same time in these same sectors the extra cost on risk imposed by a relatively weak or uncertain policy environment may be a heavy burden for start-ups.

Digging further into the link to net job contribution, the Table uncovers the components that might be more likely to be related to policy. A quick scan of Table 3 is sufficient to see that post-entry growth is generally correlated with policies, with the link being insignificant only when considering indicators of competition and independence of the banking sector, suggesting that seed and early-stage finance support policies, access to loans, and VC availability might be more relevant for entrants and young firms.

Table 3 shows also the second main result of the econometric analysis; i.e. the difference in the role of policy for net job contribution of entrants relative to incumbents. The comparison of the estimated coefficients for entrants with those estimated for incumbents allows inferring whether new firms are more exposed or more dependent on national policies, with respect to older businesses. In many cases, the differences are statistically significant and point to a higher exposure of start-ups to the policy environment than incumbents. In volatile industries, the difference in the estimated coefficients between entrants and incumbents is statistically different for six out of ten policy indicators: time to resolve insolvency, time to enforce contracts, tribunal specialisation, VC availability, easiness of access to loans, and share of banks controlled by the government (Table 3, column 1). Furthermore, when the difference is not significant this is mainly due to imprecise estimates of the effects on incumbents, with the coefficients on entrants being still remarkably larger in absolute value than those on incumbents.

The following paragraphs describe in more detail the link of net job contribution and its components with the specific policies, highlighting differences relative to incumbents when these arise.

The Table shows that longer resolving insolvency time in sectors characterised by higher volatility is negatively related to the net job contribution by surviving entrants and to a much lesser extent by surviving incumbents, through lower post-entry growth and lower number of entering units. Weaker contract enforcement is negatively associated with entrants' net job contribution, mostly through lower average size and – to a more limited extent – via lower post-entry growth. A similar but weaker correlation also holds for incumbents' employment growth. On the other hand, specialisation of tribunals is positively correlated with net job contribution of entrants only, mostly through higher average size and, to a lower extent, higher post-entry growth. None of the three policies considered is related to survival share, either for entrants or for incumbents.

Table 3. Regressions results with sector variable: volatility; three-year period

Policy / Var. dep.		(1) Net job contribution	(2) Average size	(3) No. of units	(4) Employment growth	(5) Survival share
Resolving insolvency time	Incumbents	-0.0432**	0.0215	-0.0651***	-0.0116***	0.000907
	Entrants	-0.129***	-0.0118	-0.0955***	-0.0296***	0.00175
	Diff.	-0.086**	-0.033	-0.030	-0.018	0.001
Enforcing contracts time	Incumbents	-0.0136	-0.00107	-0.0126	-0.00561**	0.0013
	Entrants	-0.0820***	-0.0883***	0.015	-0.0177*	0.00565
	Diff.	-0.068**	-0.087***	0.028	-0.012	0.004
Specialised tribunals	Incumbents	0.00275	0.0105	-0.015	0.00295	-0.0018
	Entrants	0.0829***	0.0774***	0.0188	0.0218*	0.00319
	Diff.	0.080**	0.067**	0.034	0.019	0.005
Finance policy tax-based	Incumbents	0.0291	0.0310*	-0.0037	0.00405	-0.00318
	Entrants	0.0837***	0.0634**	-0.00717	0.0271**	0.00158
	Diff.	0.055	0.032	-0.003	0.023*	0.005
Finance policy equity-based	Incumbents	0.0243	-0.00919	0.0232	0.0222***	-0.00647*
	Entrants	0.0911**	-0.0146	0.0276	0.0689***	-0.00402
	Diff.	0.067	-0.005	0.004	0.047***	0.002
VC availability	Incumbents	0.0829***	-0.0545***	0.134***	0.0147***	-0.00362
	Entrants	0.193***	0.0292	0.137***	0.0355***	-0.00041
	Diff.	0.110***	0.084***	0.003	0.021*	0.003
Access to loans	Incumbents	0.0699***	-0.0466***	0.113***	0.0141***	-0.00354
	Entrants	0.161***	0.0287	0.103***	0.0324***	-0.0016
	Diff.	0.091***	0.075**	-0.010	0.018	0.002
% of gov.-controlled banks	Incumbents	-0.0516***	0.0742***	-0.128***	-0.00784**	0.00116
	Entrants	-0.148***	0.0141	-0.154***	-0.0119	0.00112
	Diff.	-0.096***	-0.060**	-0.026	-0.004	0.000
Foreign banks	Incumbents	0.0344*	0.0221	0.0166	0.00101	0.00554*
	Entrants	0.0741**	0.0866***	-0.00654	0.0142	0.00539
	Diff.	0.040	0.065**	-0.023	0.013	0.000
Supervision indep. index	Incumbents	-0.00646	0.0306**	-0.0415**	0.00749***	0.00419
	Entrants	0.0149	0.0768***	-0.0763***	0.016	-0.00403
	Diff.	0.021	0.046*	-0.035	0.009	-0.008

Notes: each coefficient shown in the Table comes from an individual regression. The number of observations is always equal to 981, except the regressions with *Specialised tribunals* and *Finance policy* as policy variables, as the lack of data for Brazil reduces the sample size to 909. Country, sector, and year dummies are included in all regressions. All models are estimated as Seemingly Unrelated Regressions. *Y* refers to cohorts of entrants or incumbents between time *t* and *t+3* (where *t* equals 2001, 2004 or 2007, depending on availability). The difference between the entrants' and the incumbents' coefficients is separately reported. Detailed definitions of policy, sector and dependent variables are provided in Sections 3 and 4. Note that data for some countries are still preliminary. *** p<0.01, **p<0.05, * p<0.1.

Seed and early-stage finance policies play an overall positive role particularly for entrants in more volatile sectors: they are associated with higher size of entrants (only when tax-based) and with higher post-entry growth (mostly in the equity-based case). Overall the association is always positive and significant. VC availability is linked with net job contribution by surviving entrants through higher entry rates and faster post-entry growth. For incumbents, seed and early-stage finance support policies do not appear to matter for overall net job contribution but are correlated with average size at entry (tax-based) and employment growth (equity-based), although the magnitude of the coefficient is about half to a third of those for entrants. Interestingly, VC is positively correlated with net job contribution by incumbents, again to a much smaller extent than for entrants, mainly via a larger number of units with smaller average size and higher growth. Ease of accessing loans in industries characterised by higher volatility has a positive role for overall net job contribution by surviving entrants and to a lesser extent by incumbents, mostly via a positive effect on number of units – with the coefficient being virtually the same for entrants and incumbents – and post-entry growth, especially for entrants.

Interestingly, indicators of competition and efficiency of the banking sectors are related to net job contribution of both entrants and incumbents, mainly through the number of units in the market and their average size rather than to post-entry growth performance, especially for entrants. For example, the presence of a foreign bank is linked to a larger size at entry, and a large share of government-controlled banks is associated with lower entry. A higher index of supervision independence does not seem to be related to net job contribution, but this hides two opposing forces: more independence translates into larger size but also into lower number of units for both entrants and incumbents.

Finally, and perhaps surprisingly, none of the policy indicators is significantly related to the survival share of young firms in these sectors, while the survival of incumbents is only related positively to the number of foreign banks in the country and weakly negatively related with seed and early stage policy. This result, alongside the observed positive relationship of the policy with employment growth, might indicate a stronger up-or-out dynamic in the presence of such policy measures.

Net job contribution and its component in sectors with high growth dispersion: entrants vs incumbents

Results for sectors that are characterised by a large growth dispersion reported in Table 4 also generally show a strong correlation between net job contribution and policies that is – in most cases – larger and stronger than in the case of incumbents.[29] In industries characterised by high dispersion, the difference in the estimated coefficients for net job contribution over the three-year interval is significant for three policy indicators: time to resolve insolvency, tribunal specialisation, and equity-based early-stage policies. The sign of the difference is always the expected one: lengthy bankruptcy procedures are associated with less net job contribution for entrants than for incumbents, while specialised tribunals and early-stage finance policies have a much stronger positive association with entrants than with incumbents (Table 4, column 1). The differences are even stronger when looking specifically at the average growth rate: in that case, seven out of the ten policy indicators show a significantly stronger association with start-ups' post-entry growth than with incumbents' employment growth (Table 4, column 4).

When looking at the individual components of the decomposition, the survival share is almost never statistically correlated with policy variables, especially for entrants. The only indicators that are positively correlated with survival shares of entrants are the presence of foreign banks, time for resolving insolvency, and the proportion of government-controlled banks. Interestingly the latter two indicators are also associated with lower employment growth; lower entry and overall net job contribution by both incumbents and entrants, pointing to the link with a slowing down of the reallocation process for both new and existing firms. Post-entry growth is the main channel linking policies to net job contribution, with specialised tribunals and foreign banks being the only exceptions.

Table 4. Regressions results with sector variable: growth dispersion; three-year period

Policy / Var. dep.		(1) Net job contribution	(2) Average size	(3) No. of units	(4) Employment growth	(5) Survival share
Resolving insolvency time	Incumbents	-0.0245	0.0139	-0.0368**	-0.00688***	0.00872***
	Entrants	-0.0734***	0.00462	-0.0582***	-0.0296***	0.0104**
	Diff.	-0.049*	-0.009	-0.021	-0.023**	0.002
Enforcing contracts time	Incumbents	-0.0426***	-0.00146	-0.0380**	0.000397	-0.00209
	Entrants	-0.0542**	-0.0198	-0.000681	-0.0252***	-0.000156
	Diff.	-0.012	-0.018	0.037	-0.026***	0.002
Specialised tribunals	Incumbents	0.0172	-0.0116	0.0386**	-0.00588**	0.000509
	Entrants	0.0766***	0.0552**	0.0367*	0.00338	0.00343
	Diff.	0.059*	0.067**	-0.002	0.009	0.003
Finance policy tax-based	Incumbents	0.012	0.00846	0.0154	-0.0005	-0.0109***
	Entrants	0.0885***	0.0692***	-0.0071	0.0395***	-0.00679
	Diff.	0.077**	0.061**	-0.023	0.040***	0.004
Finance policy equity-based	Incumbents	0.0451**	-0.0059	0.0409*	0.0119***	-0.000499
	Entrants	0.0457	-0.041	0.0194	0.0418***	0.00968
	Diff.	0.001	-0.035	-0.022	0.030**	0.010
VC availability	Incumbents	0.0792***	-0.00522	0.0818***	0.00614**	-0.00772***
	Entrants	0.118***	-0.00709	0.0880***	0.0383***	-0.00528
	Diff.	0.039	-0.002	0.006	0.032***	0.002
Access to loans	Incumbents	0.0762***	-0.00806	0.0789***	0.00636**	-0.00555**
	Entrants	0.103***	-0.0157	0.0784***	0.0361***	-0.00269
	Diff.	0.027	-0.008	-0.001	0.030***	0.003
% of gov.-controlled banks	Incumbents	-0.0347**	0.0186	-0.0507***	-0.00586**	0.00886***
	Entrants	-0.0581**	0.0378*	-0.0702***	-0.0265***	0.0118**
	Diff.	-0.023	0.019	-0.020	-0.021**	0.003
Foreign banks	Incumbents	0.0564***	0.00163	0.0557***	0.000216	0.00829***
	Entrants	0.0213	0.0363	-0.00173	-0.0129	0.0115**
	Diff.	-0.035	0.035	-0.057*	-0.013	0.003
Supervision indep. index	Incumbents	0.0133	-0.00994	0.02	0.0000354	0.00470*
	Entrants	0.0213	0.0143	-0.0229	0.0157*	0.00289
	Diff.	0.008	0.024	-0.043	0.016	-0.002

Notes: each coefficient shown in the Table comes from an individual regression. The number of observations is always equal to 981, except the regressions with *Specialised tribunals* and *Finance policy* as policy variables, as the lack of data for Brazil reduces the sample size to 909. Country, sector, and year dummies are included in all regressions. All models are estimated as Seemingly Unrelated Regressions. *Y* refers to cohorts of entrants or incumbents between time *t* and *t+3* (where *t* equals 2001, 2004 or 2007, depending on availability). The difference between the entrants' and the incumbents' coefficients is separately reported. Detailed definitions of policy, sector and dependent variables are provided in Sections 3 and 4. Note that data for some countries are still preliminary. *** p<0.01, **p<0.05, * p<0.1.

Thus a first noteworthy result is that longer bankruptcy procedures in sectors characterised by higher growth dispersion are negatively related to the net job contribution by surviving entrants (in column 1),

through lower number of entering units (column 3), lower post-entry growth (column 4) and – to a certain extent – higher survival share (column 5) and thus, as anticipated above, through a slowing down of the reallocation process.

Weaker contract enforcement in the same sectors is negatively associated with both incumbents and entrants' net job contribution, but for incumbents this is driven by a lower number of active units, while for entrants this seems to happen mostly through a significantly lower post-entry growth. On the other hand, specialisation of tribunals is positively linked to net job contribution, mostly through a higher number of entrants which are bigger in size. No significant effect is evident on the post-entry growth component.

Seed and early-stage policies play an overall positive role: they are associated with higher size of entrants (in the tax-based case) and with higher post-entry growth. The overall link of such policies with entrants' net job contribution is significantly positive in the tax-based case, while the magnitude of the effects on the post-entry growth component is higher in the equity-based case. Incumbents seem to benefit from equity-based measures with an increase in their net job contribution, arising mainly through higher average employment growth and more units on the market.

VC availability and access to loans in sectors characterised by higher growth dispersion are both positively related to net job contribution by surviving entrants and incumbents. This occurs mostly through higher entry rates and faster post-entry growth, and for incumbents also through higher exit (lower survival) rates.

A high share of government-controlled banks has a negative estimated coefficient for both entrants and incumbents effect on surviving entrants' net job contribution. The overall effect on net job contribution is driven by a general slowing down of the reallocation process: the share of government-controlled bank is negatively related to number of entering units and to their post-entry growth prospects and is positively related to survival rates.

On the other hand, the share of foreign banks does not have a significant link to entrants' net job contribution. However, it appears to be positively related to both survival share and number of active units in sectors characterised by higher dispersion.

Net job contribution and its component in sectors that have higher financial input intensity: entrants vs incumbents

Results that focus on the heterogeneous role of policies according to the financial input intensity of sectors are presented in Table 5.

Longer bankruptcy procedures in sectors characterised by higher financial dependency are not significantly associated with lower net job contributions by surviving entrants. However, weak negative effects are evident on their post-entry growth performance. Weaker contract enforcement in the same sectors has negative effect on surviving entrants' net job contribution, mostly via lower average size and lower post-entry growth. On the other hand, court specialisation does not have any significant effect on the overall net job contribution by surviving entrants. However, it appears to be positively associated with their average size at entry.

Seed and early-stage policies play an overall positive role in sectors characterised by higher financial dependency, especially when equity-based. They are mostly associated with higher size of entrants (when equity-based), and with higher post-entry growth. The overall effect of such policies on entrants' net job contribution is positive and weakly significant only in the equity-based case, partially counterbalanced by a negative effect on the number of entering units.

VC availability in sectors characterised by higher financial input intensity positively affects net job contribution by surviving entrants through faster post-entry growth and higher average size at entry. The significance level of these coefficients is however low. Ease of access to loans in industries characterised by higher financial dependency does not have a significant effect on the overall net job contribution by surviving entrants. However, it is associated with higher average size of entrants and, to a lower extent, higher post-entry growth.

The share of government-controlled banks has a negative effect on surviving entrants' net job contribution in sectors characterised by higher financial dependency, mostly via lower number of entering units. On the other hand, the share of foreign banks has a positive and significant effect on the net job contribution by surviving entrants, mostly via higher average size of entering survivors. Higher independence of banking supervision has a similarly positive effect on the net job contribution of entrants. However, not only average size, but also post-entry growth is positively affected.

In finance-input intensive industries, the difference in the estimated coefficients between entrants and incumbents is significant for the bankruptcy variable, the contract enforcement time, the share of banks controlled by the government, and index of independence of banking supervision. The difference in the other coefficients for the finance variables is also sizeable and only marginally non-significant at the 10% confidence level (Table 5). Similarly to volatility, size at entry seems to be an important channel explaining the different association of policies with net job contribution over the three-year interval.

Last by not least, the survival share of incumbents is more correlated to policies than survival of entrants. Interestingly, however, while higher survival share of incumbents almost invariably goes hand-in-hand with lower employment growth of both entrants and incumbents and lower net job contribution of both groups in sectors with high growth dispersion, in sectors that are more heavily dependent on financial inputs, the length of bankruptcy procedure is associated a higher survival share of incumbents; negative employment growth but also with higher average size yielding an overall positive net job contribution by incumbents (the same holds for the share of government-controlled banks that are however strongly negatively correlated with entrants growth). In a specular way, tax-based finance policy measures, access to loans and VC availability are negatively associated with survival rates of incumbents, but with positive employment growth, and with no strong positive association with overall net job contribution. These results might again point to the importance of investigating potential regulatory incumbency and the role of bankruptcy legislation in "favouring" incumbents relative to entrants.

Table 5. Regressions results with sector variable: financial input intensity; three-year period

Policy / Var. dep.		(1) Net job contribution	(2) Average size	(3) No. of units	(4) Employment growth	(5) Survival share
Resolving insolvency time	Incumbents	0.0464***	0.0391***	0.00833	-0.00565**	0.00516**
	Entrants	-0.0384	-0.0113	-0.0209	-0.0172*	0.00523
	Diff.	-0.085***	-0.050*	-0.029	-0.012	0.000
Enforcing contracts time	Incumbents	0.00498	-0.0154	0.021	-0.00598**	0.00344
	Entrants	-0.0500**	-0.0737***	0.0312	-0.0190**	0.00628
	Diff.	-0.055*	-0.058**	0.010	-0.013	0.003
Specialised tribunals	Incumbents	0.00196	0.0202	-0.0382**	0.00526*	0.00431
	Entrants	0.0364	0.0506**	-0.0122	0.0155	-0.00087
	Diff.	0.034	0.030	0.026	0.010	-0.005
Finance policy tax-based	Incumbents	0.0326*	0.0629***	-0.0272	0.00144	-0.00557**
	Entrants	0.0321	0.0292	-0.0207	0.0204*	-0.00451
	Diff.	-0.001	-0.034	0.007	0.019*	0.001
Finance policy equity-based	Incumbents	0.00535	0.0288	-0.0295	0.00881**	-0.00107
	Entrants	0.0557*	0.0749***	-0.0573**	0.0460***	-0.00417
	Diff.	0.050	0.046	-0.028	0.037***	-0.003
VC availability	Incumbents	-0.00375	-0.0132	0.00885	0.00844***	-0.00444*
	Entrants	0.0468*	0.0404*	-0.0000289	0.0181*	-0.003
	Diff.	0.051	0.054**	-0.009	0.010	0.001
Access to loans	Incumbents	-0.000795	-0.00409	0.00375	0.00821***	-0.00427*
	Entrants	0.0423	0.0458**	-0.0113	0.0183*	-0.00279
	Diff.	0.043	0.050*	-0.015	0.010	0.001
% of gov.-controlled banks	Incumbents	0.0434**	0.0716***	-0.0291	-0.00558**	0.00423
	Entrants	-0.0514*	-0.00927	-0.0550**	-0.00201	0.00425
	Diff.	-0.095***	-0.081***	-0.026	0.004	0.000
Foreign banks	Incumbents	0.0148	0.0361**	-0.019	0.00208	0.000296
	Entrants	0.0573**	0.0694***	-0.00808	0.0108	-0.00503
	Diff.	0.043	0.033	0.011	0.009	-0.005
Supervision indep. index	Incumbents	-0.00383	0.0147	-0.0164	0.00538**	-0.00352
	Entrants	0.0494**	0.0546***	-0.0252	0.0240***	-0.00474
	Diff.	0.053*	0.040	-0.009	0.019*	-0.001

Notes: each coefficient shown in the Table comes from an individual regression. The number of observations is always equal to 981, except the regressions with *Specialised tribunals* and *Finance policy* as policy variables, as the lack of data for Brazil reduces the sample size to 909. Country, sector, and year dummies are included in all regressions. All models are estimated as Seemingly Unrelated Regressions. *Y* refers to cohorts of entrants or incumbents between time *t* and *t+3* (where *t* equals 2001, 2004 or 2007, depending on availability). The difference between the entrants' and the incumbents' coefficients is separately reported. Detailed definitions of policy, sector and dependent variables are provided in Sections 3 and 4. Note that data for some countries are still preliminary. *** p<0.01, **p<0.05, * p<0.1.

The magnitude of the effects

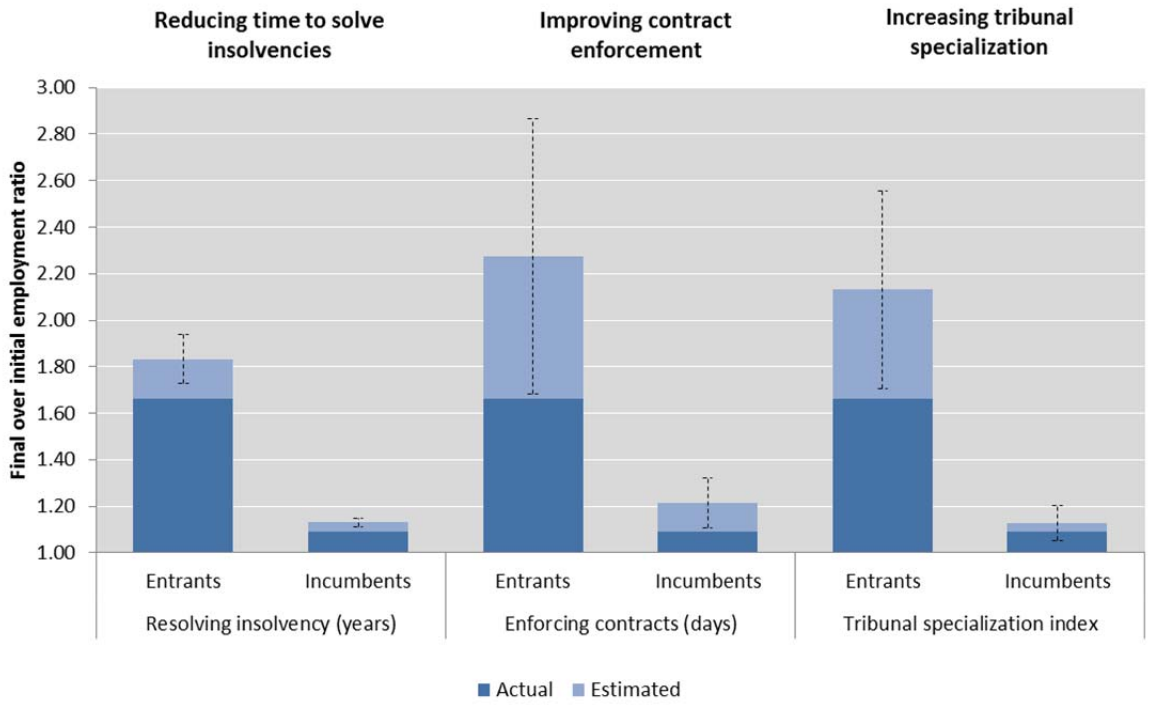
So far, the discussion has focused on the sign and the significance of the coefficients and of their difference between entrants and incumbents. Related questions are how can the coefficients' magnitude be interpreted and whether these effects are economically sizeable. A handy way to reply to these questions is a "reform simulation" exercise. This consists in using the estimated coefficients to calculate the impact on the dependent variables of a hypothetical policy reform, which would shift the value of a policy indicator in a given country from its current actual value to e.g. the top (most business-friendly) value in the sample.

A graphical illustration of this exercise is reported in Figure 8. The graph shows the estimated effect of policy reforms in the area of bankruptcy and contract enforcement in a volatile sector (with a volatility value equal to the 75th percentile of the distribution) in Italy, an OECD country with large room for improvement in this area, according to the policy indicators used in this analysis. The response variable reported in the vertical axis is employment growth, measured as the ratio between final and initial employment over the three-year period. The bars show the estimated value in the case the policy indicator would shift to the most business-friendly level in the country sample, all else being equal, for entrants and incumbents. The darker part of the bars shows the actual value registered in the DynEmp v.2 database.

For instance, resolving insolvency time in Italy is equal to 1.8 years, while in Japan is equal to 0.6 years. The estimated coefficients imply that if Italy completed insolvency procedures as quickly as it is the case in Japan, the post-entry employment growth of surviving start-ups (final over initial employment ratio) in the IT sector would rise from 1.66 to 1.83. The effect for incumbent businesses is also positive but much smaller, as can be seen in the graph (from 1.09 to 1.13). Similarly, the number of days needed to solve a civil dispute is equal to 1 210 in Italy and to 216 in New Zealand. Were Italy to reach the New Zealand value, the final over initial employment ratio would be equal to 2.27. An effect of similar magnitude – with the employment growth ratio rising to 2.13 – is estimated for a virtual reform increasing the index of tribunal specialisation from the Italian value of -1.21, to the top value of 2.80 of Finland and Netherlands. These estimated effects should not be interpreted literally, as are based on a number of strong, and sometimes unrealistic, assumptions, but are indicative to give a flavour of the magnitude of the regression coefficients, if they are interpreted causally.

Figure 8. Reform simulations related to bankruptcy regulation and civil justice

Italy: estimated effect in the information technology and other information services sector



Notes: The bars show the effect ceteris paribus of policy changes on the response variable if the econometric estimates reported in the paper are interpreted causally. The darker part of the bars shows the actual value registered in the DynEmp v.2 database. Dashed lines show 95% confidence intervals. The response variable is final over initial employment ratio.

5.2. Robustness

The main estimations are complemented by a number of robustness tests, which leave the general conclusions unaffected, while providing with a few additional ancillary results. The result tables are omitted for brevity, but are available from the authors upon request. The tests are the following:

- Including interacted year-country dummies.
- Applying different winsorization levels (i.e., the top and bottom N% of the distribution is set equal to the $(100\text{-}N)^{th}$ and $(1+N)^{th}$ percentiles, respectively, with N equal to 0 or 5; in the main regressions, N is equal to 1).
- Looking at a five-year interval rather than at the three-year interval.
- Estimating the main models with OLS rather than SUR, and clustering the standard errors at sector level.
- Estimating the regression with survival share as dependent variable with a Tobit model.
- Running the SUR regressions with weights corresponding to the number of units contained in each sector-country-year combination, as suggested by Angrist and Pischke (2008) in the case of micro-aggregated data.

The main model is also estimated including an indicator of barrier to entrepreneurship from product market regulation (PMR – BE) and an index of employment protection legislation (EPL) as policy variables (Table B.6). More stringent PMR has a negative association with net job contribution in volatile, growth-dispersed, and financially dependent industries; the strength of the association is similar for entrants and incumbents and the difference is never statistically significant. More stringent EPL is associated with lower net job contribution by both entrants and incumbents in volatile sectors, and by incumbents in growth-dispersed sectors; in the first case the coefficient magnitude is significantly larger (in absolute value) for entrants.

A final robustness check has been conducted whereby for the different sector characteristics – volatility, growth dispersion, and financial input intensity – all policy indicators have been included at once. In order to minimise problems of multi-collinearity, all measures related to contract enforcement, equity finance and banking have been grouped in three synthetic policy indicators based on an average of the normalised value (scaled from 0 to 1) of each of the underlying indicators.[30] This is a rather crude measure, but it should provide a first indication of which policy measures might be more strongly associated with job growth of firms in different sectors.

The results are reported in Table 6. For brevity, the table only reports the robustness of column 1 in the previous tables, where the dependent variable is net job contribution. The results are interesting and seem plausible: in highly dispersed and in volatile industries, judicial efficiency, VC and seed and early-stage finance policy measures are associated with higher net job contribution by entrants. For incumbents in sectors that have high growth dispersion the only significant policy indicator is regulation and competition in the banking sector, while in sectors that have higher financial input intensity, longer bankruptcy procedures remain a positive predictor of net job contribution by incumbents as discussed in the results to Table 5.

Table 6. Robustness check: "horse race"

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent variable	Net job contribution								
Group of firms	Entrants	Incumb.	Entrants	Entrants	Incumb.	Entrants	Entrants	Incumb.	Entrants
Resolving insolvency time	0.0264	0.302	-0.255						
X Dispersion	(0.405)	(0.243)	(0.396)						
Judicial efficiency	0.501**	-0.0429	0.541***						
X Dispersion	(0.217)	(0.133)	(0.142)						
VC & Early stages finance	0.443**	0.0900	0.359**						
X Dispersion	(0.189)	(0.139)	(0.156)						
Bank regulation	-0.144	0.486**	-0.597**						
X Dispersion	(0.301)	(0.223)	(0.229)						
Resolving insolvency time				0.113	0.636***	-0.489			
X financial input intensity				(0.372)	(0.198)	(0.293)			
Judicial efficiency				0.153	-0.0361	0.187			
X financial input intensity				(0.183)	(0.164)	(0.140)			
VC & Early-stage finance				0.0933	0.0287	0.0660			
X financial input intensity				(0.191)	(0.104)	(0.151)			
Bank regulation				0.287	0.148	0.146			
X financial input intensity				(0.239)	(0.195)	(0.208)			
Resolving insolvency time							0.370	0.198	0.189
X Volatility							(0.619)	(0.529)	(0.314)
Judicial efficiency							0.425*	-0.134	0.547***
X Volatility							(0.235)	(0.150)	(0.148)
VC & Early-stage finance							0.849**	0.312	0.564**
X Volatility							(0.311)	(0.204)	(0.209)
Bank regulation							-0.0940	0.122	-0.206
X Volatility							(0.323)	(0.210)	(0.218)
Incumbent values controls	NO	NO	YES	NO	NO	YES	NO	NO	YES
Observations	981	981	981	981	981	981	981	981	981
R-squared	0.759	0.800	0.843	0.755	0.798	0.843	0.764	0.799	0.846

Notes: *Y* refers either to surviving incumbents or to surviving entrants between time *t* and *t+3* (where *t* equals 2001, 2004 or 2007, depending on availability). Country, sector, and year dummies are included in all regressions. Detailed definitions of policy, sector and dependent variables are provided in Sections 3 and 4. Note that data for some countries are still preliminary. *** p<0.01, **p<0.05, * p<0.1.

6. Conclusions and next steps

This paper presents an analysis of the association of policy indicators in the field of bankruptcy regulation, contract enforcement, and access to finance (e.g. venture capital availability and competition in the banking sector) with business dynamics. Thanks to the richness of the recently collected DynEmp v.2 database, it is possible to compare the role of national policies on job creation; entry rates; post-entry growth and survival of entrants relative to incumbents, within the same country, sector, and time period.

The econometric analysis uncovers four main results. First, start-ups in sectors that are more volatile, that are characterised by a larger difference between top and bottom performers, and that are more dependent on financial inputs, are more exposed to the national policy environments. While the role of policy in finance-dependent industries is a consolidated result in the economic literature, the finding on volatility and growth dispersion are, to the best of the authors' knowledge, new. Second, in the sectors that are more volatile and more dispersed in terms of employment growth outcomes, the linkages of employment growth with policies are much stronger for entrants than for incumbents. This might point to the possible relevance of "regulatory incumbency", i.e., the prominent position and lobbying power of incumbents in the policy debate, exacerbated by the lack of advocates for the instances of young firms and prospective entrants. Furthermore, regulation is often designed with the established technological and business paradigms in mind, which may create further barriers for entrants advancing new and disruptive technologies or business models. Third, bankruptcy regulations and contract enforcement are important policy domains not only for the growth dynamics of start-ups, especially in the aforementioned sectors; but also for the growth dynamics of incumbents with lengthy bankruptcy procedures being associated with higher probability of survival and a slowing down of the reallocation process. Fourth, the survival share especially of start-ups does not seem to be particularly affected by policy, in particular in highly volatile sectors. On the other hand, the survival of incumbent firms, especially in sectors that are intensive in financial inputs is significantly related to the length of bankruptcy procedures and to the availability of finance.

The finding that start-ups in volatile sectors, and in sectors characterised by high growth dispersion, are more exposed to policy is particularly relevant for policy makers, because these sectors are also characterised by larger employment growth. As Haltiwanger et al. (2015) forcefully argue, high dispersion and positive skewness of the growth rate distribution are important prerequisites to produce high-growth firms. Policy failures – like poor contract enforcement or lengthy bankruptcy procedures – that impose an extra cost to risk may lead to systematic underinvestment in these sectors. The same may hold true for policy uncertainty, triggered by unclear policy objectives and strategies, unstable or weak governments, and frequent and unpredictable policy reversals.

The findings that policy may affect the net job contribution by entrants more than by incumbents may highlight the importance of considering the potential impact of the policy on potential entrants and start-ups even though these firms might not have strong "voices" that are heard by politicians as easily as incumbents.

Finally, the result that survival of entrants are generally not affected by policies, contrary to incumbents', suggests that policy makers may need to allow for the possibility that policies will likely operate through different margins for entrants (e.g. entry and post-entry growth for entrants) and for incumbents (growth and exit) to affect the overall net job contribution by these different groups.

The work presented in this paper can be expanded in a number of different directions. First, a detailed characterisation of volatility – in terms of firm age, size, sector of activity, cross-country differences, and evolution over time – can fruitfully complement this paper by increasing policy makers' awareness on

which firms may benefit more from policy reforms. Furthermore, to the extent that differences in firm employment growth rates are also reflected in wage differentials and their developments, growth dispersion and volatility can also be linked to the analysis of wage inequality and its drivers. Second, the construction of more detailed policy indicators would allow developing more precise normative policy prescriptions on reforms that could inform the policy agenda to foster employment creation and productivity growth. Third, a more detailed analysis of the implications of policy uncertainty for employment growth may contribute to better quantify the economic costs of political instability and "short-termism".

Fourth, volatility and dispersion can also be linked to productivity. For instance, the extent to which volatility and dispersion are associated with higher resource reallocation and the role that policies may have in allowing such process or in hindering it would be very interesting and relevant. The analysis could link measures of dispersion and volatility to measure of allocative efficiency and resource misallocation (for example those derived in the forthcoming OECD "MultiProd" database) and investigate the role of policy distortions, introduced for example by size-contingent policies, and policy uncertainty.

ENDNOTES

1 Scuola Superiore Sant'Anna; Paris School of Economics – University Paris 1 and OECD Directorate for Science, Technology and Innovation.

2 OECD Directorate for Science, Technology and Innovation.

3 OECD Directorate for Science, Technology and Innovation.

4 This may depend on the sunk costs and economy of scale related to lobbying. For instance, Kerr, Lincoln, and Mishra (2014) show that lobbying is strongly related to firm size and that that firms' lobbying status is highly persistent over time.

5 In sectors with highly dispersed growth, two out of ten policy indicators estimated coefficients are weakly significant (at the 5% level). All other estimates are insignificant.

6 However, the authors also suggest that financial development may curb entry of large firms in sectors mostly dependent on external finance. The disproportionately positive role of financial development especially for small firms is confirmed by Beck et al. (2008).

7 Skewness is defined as the difference between the 90^{th} to 50^{th} gap and the 50^{th} to 10^{th} percentile gap. The authors find that for young firms this difference is more likely to be positive.

8 The OECD DynEmp team has developed customised modules for those countries requesting it so that part or all of the confidentiality checks are conducted automatically and internally by the Stata routine.

9 This paper does not include data for all these countries yet.

10 A number of other countries are in the process of running the routine and will be included in the database in the near future.

11 Measured as the ratio of the net job contribution by surviving entrants at time t+3 over the country total employment at time *t*.

12 On average over time, for the whole non-financial business sector.

13 Entrants with 0-9 employees in the whole non-financial business sector.

14 The graph is extracted from the outcomes of one of the "distributed regressions" which are performed by the DynEmp routine (see Criscuolo, Gal and Menon, 2014b for further details). Regressions include controls for units' size class, three-digit sector and year.

15 Different contributions adopt heterogeneous definitions and calculate growth volatility using different underlying variables (including proxies of output, employment and sales). A note of caution therefore has to apply when comparing results from different sources.

16 In optimal portfolio theory's mean-variance framework volatility is a measure of risk. In such a framework, riskier assets are associated with higher returns.

17 Imbs (2007) shows that only country-specific components of aggregate volatility affect aggregate estimates, while the disaggregated relationship is also affected by sector-specific and residual components, whose role is masked by aggregation.

18 In the DynEmp v.2 database, employment growth volatility is calculated as the weighted average of the standard deviation of the yearly employment growth index at firm level over time. The weights are equal to the firms' average employment over the same time period (see Criscuolo, Gal and Menon, 2014b, for details).

19 Unreported robustness checks show that results do not depend on the inclusion or exclusion of outliers.

20 Recall that if volatility measures the *within*-firm variability in employment growth, growth dispersion measures the *between*-firm variability in the same variable. It is calculated as the difference between the average employment growth rate of firms at the top and the bottom 10% of the growth distribution, respectively. The correlation between the two variables is positive and significant, and ranges between about 0.39 in the case of entrants and about 0.2 in the case of incumbents (controlling for year, sector and country-fixed effects).

21 Table B.4 in the Annex B reports the country specific values all the policy variables included in the analysis.

22 Detailed methodological information is available at http://www.doingbusiness.org/methodology/resolving-insolvency.

23 A possible alternative would be to use quantitative indicators, e.g. the amount of actual VC investments by country and stage of investments published in several editions of the OECD "*Entrepreneurship at a Glance*" publication. However, these data do not cover Brasil, New Zealand (for early stage), and Turkey, and are generally more prone to reverse causality issues, as more successful start-ups are likely to attract more VC investments.

24 In the DynEmp v.2 database, employment growth volatility is calculated as the weighted average of the standard deviation of the yearly employment growth index at firm level over time. The weights are equal to the firms' average employment over the same time period (see Criscuolo, Gal and Menon, 2014b, for details).

25 The normalisation is somehow unusual as start-up rates are more commonly normalized on the stock of firms, but it fits naturally into the decomposition elaborated in Calvino, Criscuolo, and Menon (2015). In the econometric analysis, however, the choice of the denominator is of very little relevance, in the light of the inclusion of a country fixed effect in all specifications (and of interacted year-country dummies in the robustness checks).

26 The only difference is that the net job contribution and the start-up rate in the econometric analysis do not need to be normalised on total employment, as this component is absorbed by the country dummy.

27 As all the variables are expressed in logarithmic form, the sum of the latter four variables is equal to the value of the first variable. The same therefore holds true for the regressions coefficients.

28 The significance test of the difference of the two coefficients is calculated in the following way:

$= \frac{\beta_1 - \beta_2}{\sqrt{sd_1{}^2 + sd_2{}^2}}$. The test statistic follows a Normal distribution.

29 In the only two cases (finance policy equity-based measures and foreign banks) for which the coefficients of incumbents is larger the difference is not statistically significant: in the first the magnitude is virtually

the same; in the latter however the coefficients on incumbents is twice the size of that for entrants, suggesting that the role of competition in the banking sector might deserve further investigation.

30 The group "Judicial efficiency" includes Contract enforcement time and Specialised tribunals; the group "VC & early-stage finance" include Finance policy tax-based, Finance policy equity-based, and VC availability; the group "Bank regulation" includes Access to loans, Foreign banks, Share of government-controlled banks, and Supervision independence index.

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ANNEX A – METADATA

This Annex describes the main characteristics of the source data. Further information concerning the functioning of the DynEmp routine, the levels of analysis and the specificities of the output databases is instead available in Criscuolo, Gal and Menon (2015).

The unit of analysis for each of the countries included so far in the DynEmp v.2 database is the enterprise.

In the following, Table A.1 provides details on the national data sources underlying the database; Table A.2 describes the timing of recoding of the employment variable (yearly average or point in time); Table A.3 includes the minimum employment and turnover thresholds above which units are included in the national source data; Table A.4 summarizes the employment recording units in different countries (headcount or full-time equivalent).

Further details concerning other features of the national source data can be found in Criscuolo, Gal and Menon (2014a), for those countries which are included in both the DynEmp Express and the DynEmp v.2 database.

Table A1. Employment data characteristics – National data sources

Country	National data characteristics
AUT	Social security files
BEL	Business register
BRA	Annual Social Information Record (RAIS)
CAN	Longitudinal administrative database of enterprises - The Longitudinal Employment Analysis Program (LEAP)
CRI*	Business register
DNK	Enterprise statistics (ES)
ESP	Business Register
FIN	Business register and Structural Business Statistics Database
GBR	Business Structure Database (BSD)
HUN	Tax Records
ITA	Business register (ASIA)
JPN**	Establishment and Enterprise Census (EEC) and Census of Manufacturers
LUX	Business register
NLD	Business Register. Additional information available in SBS.
NOR	Business Register (BRA) / Fiscal or tax register (F)
NZL	Comprehensive LEED data constructed from Longitudinal Business Frame and monthly Pay-As-You-Earn tax filing. Business Frame largely maintained using tax and company office records
PRT	Business Register
SWE	Tax Register
TUR	Entrepreneur Information System (based on Tax register and Social Security System)

Notes: *for Costa Rica no transition matrix is available due to the limited time extension of the source data; **for Japan data refer to the manufacturing sector only.

Source: OECD DynEmp v.2 database. Data for some countries are still preliminary.

Table A2. Employment data characteristics
Timing and recording

Country	Timing and recording	
	Yearly average	Point in time
AUT		
BEL	For FTE	For HC
BRA		
CAN	Payroll	Maximum
CRI*		
DNK	For FTE	For HC
ESP		
FIN		
GBR		
HUN		
ITA		
JPN**		
LUX		
NLD		
NOR		
NZL	Monthly	
PRT		
SWE		
TUR		

Notes: *for Costa Rica no transition matrix is available due to the limited time extension of the source data; **for Japan data refer to the manufacturing sector only.

Source: OECD DynEmp v.2 database. Data for some countries are still preliminary.

Table A3. Employment data characteristics
Minimum employment and turnover thresholds for inclusion in the database

Country	Minimum employment and turnover thresholds for inclusion in the database				
	0-1	>1	>3	>5	>20
AUT					
BEL					
BRA					
CAN					
CRI*					
DNK					
ESP					
FIN					
GBR					
HUN	HUNF50M in two consecutive years				
ITA					
JPN**					
LUX					
NLD					
NOR					
NZL	>30k NZL				
PRT					
SWE					
TUR					

Notes: *for Costa Rica no transition matrix is available due to the limited time extension of the source data; **for Japan data refer to the manufacturing sector only.

Source: OECD DynEmp v.2 database. Data for some countries are still preliminary.

Table A4. Employment data characteristics
Recording units (HC vs. FTE)

Country	Recording units (FTE vs. HC)	
	FTE	HC
AUT		
BEL		
BRA	Can be calculated from hours	
CAN	Payroll	PD7
CRI*		
DNK		
ESP		
FIN		
GBR		
HUN		
ITA		
JPN**		
LUX		
NLD		
NOR		
NZL		
PRT		
SWE		
TUR		

Notes: *for Costa Rica no transition matrix is available due to the limited time extension of the source data; **for Japan data refer to the manufacturing sector only. HC indicates headcount and FTE indicates full time equivalent.

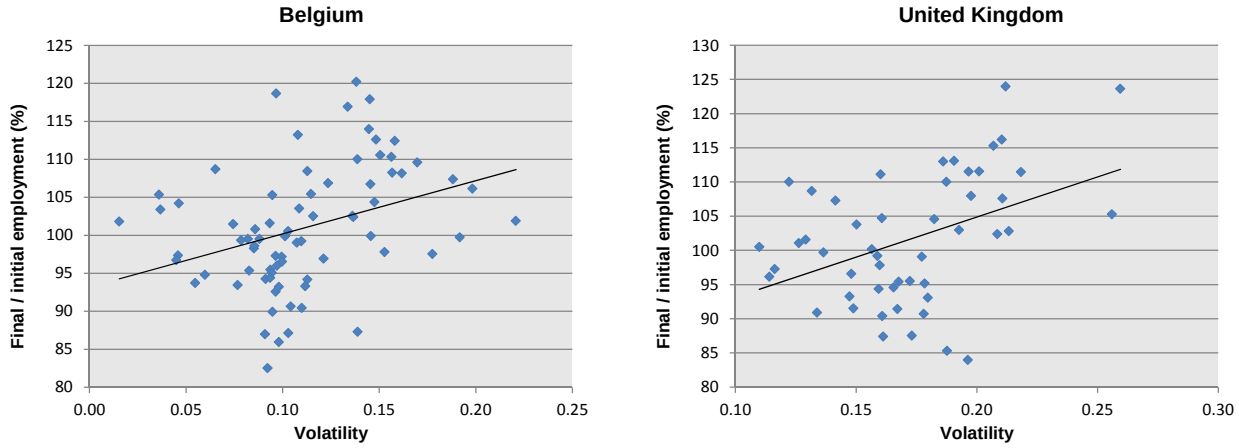
Source: OECD DynEmp v.2 database. Data for some countries are still preliminary.

ANNEX B – ADDITIONAL GRAPHS AND TABLES

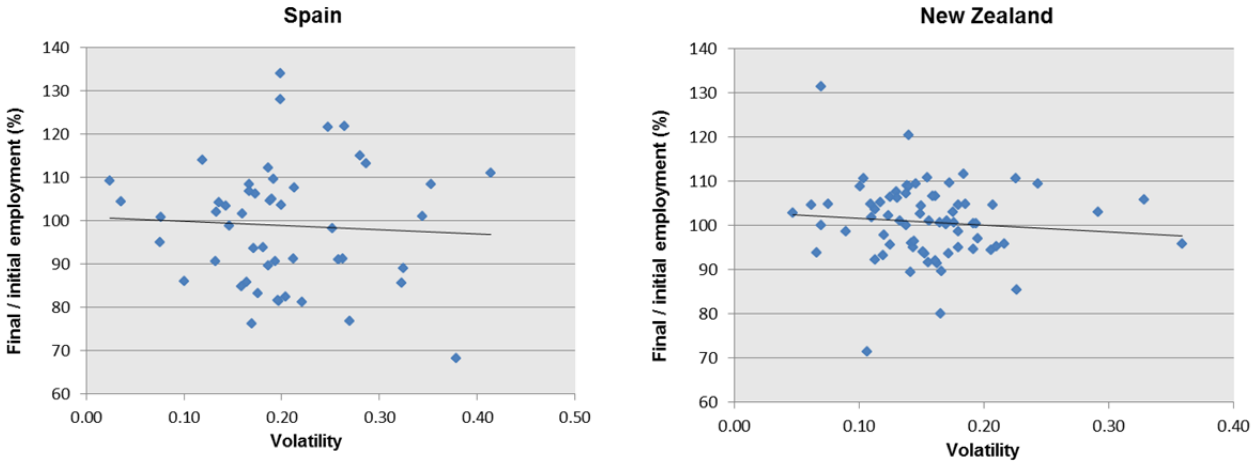
Figure B.1 Volatility and growth link: country specificities

Two-digit sector aggregation – Surviving incumbent units only

Panel A



Panel B



Notes: the Figure illustrates the link between the employment growth volatility index (volatility, on the horizontal axis) and the average employment growth index (on the vertical axis, measured as the ratio of employment at time *t+3* and employment at time *t* of surviving incumbents). Each dot in the scatter represents a two-digit sector. Available years for each country are pooled together (*t*=2001, 2004 and 2007). A linear fit is superimposed to the graphs. The focus is on surviving incumbents only. Qualitatively similar figures are obtained excluding outliers (filtering method: 1.5*interquartile range). Owing to methodological differences, figures may deviate from officially published national statistics.

Source: OECD DynEmp v.2 database. Data for some countries are still preliminary.

Table B.1 Volatility, growth and survival regressions

Two-digit sector aggregation

	(1) Growth rate	(2) Survival share
Volatility	1.157***	-0.0566**
	(0.0923)	(0.0265)
Constant	-0.0664	0.702***
	(0.0516)	(0.0188)
Year, country, sector and age fixed effects	YES	YES
Observations	2,016	2,016
R-squared	0.626	0.479

Notes: The fitted model is $Y_{ackt} = \alpha_0 + \text{volatility}_{ackt} + \theta_t + \kappa_c + \gamma_k + \partial_a + \varepsilon_{ackt}$ where α_0 is constant; θ, κ, γ and ∂ are year, country, sector and age class (entrants or incumbents) dummies; *t, c, k* and a subscripts indicate year, country, two-digit sector and age class (entrants or incumbents); ε_{ackt} is the error term. *Y* is alternatively (1) the average employment growth rate (measured as the ratio of the difference between employment at time *t+3* and employment at time *t* over the average employment between time *t* and *t+3*) or (2) the survival share (calculated as number of incumbent units surviving at time *t+3* over total number of incumbent units at time *t*). Heteroscedasticity robust standard errors are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1. A companion Table that uses simply the ratio of employment at time *t+3* and employment at time *t* shows very similar results and is available from the authors upon request. The sample of countries included corresponds to the one used for the econometric analysis.

Source: OECD DynEmp v.2 database. Data for some countries are still preliminary.

Table B.2 Volatility and dispersion correlation

	(1) Volatility (entrants)	(2) Volatility (incumbents)
Dispersion	0.390***	0.205*
	(0.0543)	(0.112)
Constant	-1.808***	-2.303***
	(0.0448)	(0.0486)
Year, country, sector and age fixed effects	YES	YES
Observations	859	878
R-squared	0.422	0.614

Notes: The fitted model is $\log Y_{ckt} = \alpha_0 + \log \text{dispersion}_{ckt} + \theta_t + \kappa_c + \gamma_k + \varepsilon_{ckt}$ where α_0 is constant; θ, κ, γ are year, country, sector dummies; *t, c, k* subscripts indicate year, country, 2-digit sector; ε_{ckt} is the error term. *Y* is alternatively (1) employment growth volatility of surviving incumbents or (2) employment growth volatility of surviving entrants, both calculated between time *t* and *t+3*. Heteroscedasticity robust standard errors clustered by two-digit sector are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Available years for each country are pooled together (*t* = 2001, 2004 and 2007). Qualitatively similar estimates are obtained excluding outliers (filtering method: 1.5*interquartile range). Owing to methodological differences, estimates may deviate from officially published national statistics. The sample of countries included corresponds to the one used for the econometric analysis.

Source: OECD DynEmp v.2 database. Data for some countries are still preliminary.

Table B.3 Volatility and dispersion rankings by two-digit sector

	Volatility of entrants	Volatility of incumbents	Dispersion
Telecommunications	1	12	1
Administrative and support service activities	2	4	5
Scientific research and development	3	10	2
Publishing, audiovisual and broadcasting activities	4	8	8
Accommodation and food service activities	5	3	3
IT and other information services	6	5	4
Construction	7	6	7
Real estate activities	8	2	6
Computer, electronic and optical products	9	13	14
Coke and refined petroleum products	10	24	25
Advertising and market research	11	1	11
Legal and accounting activities	12	7	9
Chemicals and chemical products	13	23	20
Basic pharmaceutical products	14	25	18
Textiles, wearing apparel, leather and related products	15	14	13
Furniture; other manufacturing	16	11	16
Rubber and plastics products	17	21	24
Machinery and equipment n.e.c.	18	17	23
Basic metals and fabricated metal products	19	16	21
Transportation and storage	20	15	10
Wood and paper products and printing	21	18	19
Wholesale and retail trade, repair of motor vehicles	22	9	12
Food products, beverages and tobacco	23	20	17
Transport equipment	24	22	15
Electrical equipment	25	19	22
Rank correlation with Volatility of entrants	*1*		
Rank correlation with Volatility of incumbents	*0.5792*	*1*	
Rank correlation with Dispersion	*0.7023*	*0.7823*	*1*

Notes: the Table shows the ranking of two-digit sectors by their employment growth volatility of surviving entrants, surviving incumbents and by employment growth dispersion (from sectors with high volatility/dispersion to those with low volatility/dispersion). Rankings are calculated on the country-yearly averages of employment growth volatility and employment growth dispersion. The time periods (*t*) under analysis are 2001, 2004 and 2007, conditional on availability. Employment growth volatility is computed between time *t* and *t+3* from the transition matrix dataset while employment growth dispersion is sourced from level 3 dataset. Outliers based on the distribution of each variable (filtering method: 1.5*interquartile range) are excluded from the computation. Spearman's rank correlation coefficients are reported in the last rows. The sample of countries included corresponds to the one used for the econometric analysis. Owing to methodological differences, estimates may deviate from officially published national statistics.

Source: OECD DynEmp v.2 database. Data for some countries are still preliminary.

Table B.4 Policy indicators – country values

Country	Supervision indep. index	Foreign banks	% of gov.-controlled banks	Active policies tax-based	Active policies equity-based	Enf. contracts days	Resolving insolvency years	VC availability	Access to loans	Tribunal specialisation
AUT	3	19.4	0.1	2	1	397	1.1	4.25	4.18	-1.97
BEL	2	21.0	0.0	2	5	505	0.9	4.31	4.21	0.20
BRA	2	19.9	45.2			731	4	2.79	2.52	
DNK	2	21.0	0.0	0	3	380	3	5.51	4.90	-2.67
ESP	1	10.2	0.0	0	1	515	1.5	4.00	4.21	0.96
FIN	2	57.2	0.0	0	6	235	0.9	5.40	5.21	2.80
GBR	1	46.0	0.0	2	7	404	1	5.33	5.07	0.26
HUN	3	96.1	0.0	0	3	335	2	3.67	3.37	2.14
ITA	2	11.1	9.3	0	1	1210	1.8	2.88	2.89	-1.21
JPN	1	5.9	1.1	1	0	360	0.6	3.65	3.86	0.30
LUX	2	94.6	5.1	0	1	321	2	5.12	4.87	1.47
NLD	2	8.9	4.5	1	3	514	1.1	5.30	5.19	2.80
NOR	3	23.0	0.0	0	3	310	0.9	5.49	5.18	-2.67
NZL	3	98.0	1.0	0	2	216	1.3	5.09	4.64	-0.64
PRT	3	16.0	25.0	0	3	577	2	4.48	3.74	0.30
SWE	2	0.0	0.0	0	4	508	2	5.23	4.92	-0.46
TUR	3	16.56	31.60	1	2	420	3.3	3.15	2.85	-0.37
Average	*2*	*33.2*	*7.2*	*1*	*3*	*467*	*1.7*	*4.45*	*4.23*	*0.08*
Standard deviation	*1*	*32.0*	*13.1*	*1*	*2*	*224*	*0.9*	*0.92*	*0.86*	*1.66*

Source: OECD DynEmp v.2 database; World Bank Doing Business Database; World Bank Banking regulation and supervision surveys; WEF Global Competitiveness Database; OECD (2014).

Table B.5 Descriptive statistics

Variable	N	mean	st. dev.	p25	p50	p75
			Dependent variables			
Net job contribution* entrants	981	1.38	2.46	0.15	0.50	1.56
- incumbents	981	38.04	47.09	9.33	21.04	45.42
Survival share entrants	981	0.66	0.13	0.57	0.65	0.74
- incumbents	981	0.76	0.08	0.72	0.77	0.81
Employment growth entrants	981	1.92	3.07	1.23	1.52	1.94
- incumbents	981	1.02	0.14	0.95	1.01	1.08
Average size entrants	981	7.38	14.79	1.90	3.25	6.86
- incumbents	981	30.09	42.87	7.47	16.94	35.21
No. of units entrants	981	3176.70	11026.15	57.00	275.00	1492.00
- incumbents	981	29592.51	99328.78	1174.00	4059.00	19054.00
			Sector exposure variables			
Growth dispersion	981	1.72	0.27	1.51	1.68	1.94
Financial input intensity	981	0.017	0.010	0.008	0.015	0.019
Volatility	981	0.18	0.04	0.15	0.18	0.21
			Policy variables			
Res. insolvency (years)	981	2.04	1.97	1.00	1.50	2.00
Enf. contracts (days)	981	496.43	273.30	335.00	404.00	514.00
Tribunal specialisation	909	0.08	1.77	-1.21	0.20	1.47
Active policy tax-based	909	0.45	0.75	0.00	0.00	1.00
Active policy equity-based	909	2.19	1.69	1.00	2.00	3.00
VC availability	981	4.30	0.87	3.80	4.65	4.93
% of gov.-controlled banks	981	7.24	12.12	0.00	1.81	6.22
Access to loans	981	4.45	0.92	3.67	4.92	5.22
Foreign banks	981	29.42	33.73	7.96	16.54	42.13
Supervision indep. index	981	1.89	0.95	1.50	2.00	2.33

** Normalised by 1000s' employees in the country (non-financial business sector)*

Source: OECD DynEmp v.2 database; World Bank Doing Business Database; World Bank Banking regulation and supervision surveys; WEF Global Competitiveness Database; OECD (2014).

Table B.6 Regressions results with EPL and PMR-BE as policy variables; three-year period

Policy / Var. dep.		(1) Net job contribution	(2) Average size	(3) No. of units	(4) Employment growth	(5) Survival share
Industry variable: volatility						
Employment protection legislation	Incumbents	-0.0376**	0.0311*	-0.0747***	-0.00544*	0.00435
	Entrants	-0.109***	-0.0219	-0.0786***	-0.0190	0.00310
	Diff.	-0.071**	-0.053*	-0.004	-0.014	-0.001
PMR: barriers to entrepreneurship	Incumbents	-0.102***	0.0308*	-0.131***	-0.0116***	-0.00319
	Entrants	-0.143***	0.0146	-0.134***	-0.0267**	-0.00884
	Diff.	-0.041	-0.016	-0.003	-0.015	-0.006
Industry variable: growth dispersion						
Employment protection legislation	Incumbents	-0.0826***	-0.0568***	-0.0270	-0.00768**	-0.000494
	Entrants	-0.0370	-0.00891	-0.0102	-0.0209*	0.00598
	Diff.	0.046	0.048	0.017	-0.013	0.006
PMR: barriers to entrepreneurship	Incumbents	-0.0668***	0.00705	-0.0749***	-0.00875***	0.00773***
	Entrants	-0.0517*	0.0332	-0.0713***	-0.0109	-0.00103
	Diff.	0.015	0.026	0.004	-0.002	-0.009
Industry variable: financial dependency						
Employment protection legislation	Incumbents	-0.00581	-0.0105	0.00678	-0.00308	-0.00300
	Entrants	-0.0232	-0.0469*	0.0230	-0.00172	0.00177
	Diff.	-0.017	-0.036	0.016	0.001	0.005
PMR: barriers to entrepreneurship	Incumbents	-0.102***	0.0308*	-0.131***	-0.0116***	-0.00319
	Entrants	-0.143***	0.0146	-0.134***	-0.0267**	-0.00884
	Diff.	-0.041	-0.016	-0.003	-0.015	-0.006

Notes: each coefficient shown in the Table comes from an individual regression. The number of observations is always equal to 981, except the regressions with *Specialised tribunals* and *Finance policy* as policy variables, as the lack of data for Brazil reduces the sample size to 909. Country, industry, and year dummies are included in all regressions. All models are estimated as Seemingly Unrelated Regressions. *Y* refers to cohorts of entrants or incumbents between time *t* and *t+3* (where *t* = 2001, 2004 or 2007, depending on availability). The difference between the entrants' and the incumbents' coefficients is separately reported. Detailed definitions of policy, industry and dependent variables are provided in Sections 3 and 4. Note that data for some countries are still preliminary. *** p<0.01, **p<0.05, * p<0.1.