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EMPRESAS JOVENES, EMPRENDIMIENTO, Y LA DINAMICA DEL EMPLEO Y LA PRODUCCIÓN EN LA INDUSTRIA MANUFACTURERA DE COLOMBIA

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RESUMEN

Este trabajo estudia las características y la dinámica de crecimiento de los negocios jóvenes y su contribución al crecimiento agregado en Colombia, una economía en desarrollo. Este estudio cubre 17 años comprendidos entre 1993 y 2009. Se limitó el estudio a firmas manufactureras de 10 o más empleados (algunas con menos empleados pero con producción por encima de un límite). Al hacer esto se concentró la atención al segmento de negocios jóvenes que probablemente son verdaderos esfuerzos empresariales. El estudio caracterizó a plantas jóvenes manufactureras, comparándolas con plantas más viejas. Esta caracterización cubre varias dimensiones del desempeño empresarial: empleo, producción, exportaciones, patrones de sobrevivencia, productividad e inversión. Se contrastó estos patrones con aquellos observados en Estados Unidos. También se estudió la contribución de los establecimientos de diferentes edades al crecimiento agregado del empleo y la producción a lo largo del período de 17 años. El trabajo contribuye en varios aspectos a la literatura. Primero, caracteriza la dinámica de las empresas jóvenes para un país en desarrollo. Segundo, se enfoca en establecimientos que nacieron con un tamaño suficientemente grande y que plausivamente representan verdaderas iniciativas empresariales. Este enfoque nos permite mostrar que parte de la amplia variación en los patrones de crecimiento entre los emprendimientos jóvenes encontrada en estudios previos refleja el pobre desempeño de los micro-establecimientos. En particular, se encontró muy poca destrucción de empresas jóvenes cuando el micro-segmento es eliminado de los datos.

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ABSTRACT

In this paper, we study the characteristics and growth dynamics of young businesses, and the contribution of these businesses to aggregate growth, in a developing economy: Colombia. Our study covers the 17 years between 1993 and 2009. We limit our study to manufacturing plants of 10 or more employees (and some with less employees but large production). By doing so, we concentrate our attention on the segment of young businesses that are most likely truly entrepreneurial efforts. We characterize young manufacturing plants and compare them to older ones. This characterization covers several dimensions of business performance: employment, output, exports, survival patterns, productivity and investment. We contrast these patterns with those observed in the US. We also study the contribution of establishments of different ages to overall employment and output growth over our 17 year period. The paper makes several contributions to the existing literature. First, it characterizes young business dynamics for a developing economy. Second, it focuses on establishments that are born large enough that they plausibly represent truly entrepreneurial initiatives. That focus enables us to show that part of the wide variation in growth patterns among young businesses found by previous studies reflects the poor performance of micro establishments. In particular, we find much less destruction from exit of young businesses when the micro segment is removed from the data.

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Young businesses, entrepreneurship, and the dynamics of employment and output in Colombia's manufacturing industry

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Abstract

There is ongoing debate about the role of entrepreneurship in productivity and job growth. One view is that entrepreneurs are the engines of jobs, innovation and productivity growth. From this view, countries with high barriers to entry and barriers to post-entry growth dynamics will fare poorly. An alternative view is that most young and small businesses exist either because the entrepreneur could not find a wage and salary job and/or represent the choice of individuals who would rather work for themselves (typically at home). From this view, the problem many countries face, especially in the developing world, is not too little entrepreneurship but too much – at least too many of the "subsistence" entrepreneurs who have little prospects for growth. This paper contributes to this debate with an analysis of manufacturing startups and their expansion patterns, relative to those of established businesses, in a developing economy: Colombia. Many of the obstacles to efficient entry into the market and to efficient growth are most pronounced in developing countries, and many of the questions about fostering entrepreneurship are most relevant for these countries. We use data from the Colombian Annual Manufacturing Survey, characterizing plant performance and age of Colombian manufacturing establishments with employees, over the period 1993-2009. We characterize, over the life cycle of businesses, a plant's performance and its contribution to overall growth, over a number of dimensions: employment, output, investment, productivity. For employment growth, we produce comparable statistics for the US to drive conclusions about differential patterns between the two countries. We also look at cross age-size patterns. Our main findings can be summarized as follows: 1) The average young establishment grows much faster and is more productive than the typical old one (e.g. an mean growth rate of employment of 38% for a plant aged 0-4 years, compared to an average 2% contraction for establishments aged 15 years or more); 2) Even abstracting from the contribution of entry, young incumbent plants grow substantially faster than older plants. These differences are driven by the upper tail of the growth rate distribution (at the 90% percentile); 3) While young plants grow on average faster, in any age category growth rates are positively correlated with plant size; 4) Among large (200 employees or more) relatively young establishments (4 or five years old) around 40% were small or medium sized four years before; the proportion of large establishments accounted for by small or medium establishments four years before falls to around 15% for establishments aged fifteen years or more. 5) Despite smaller establishments growing at a slower pace within an age category, young small establishments also explain the bulk of growth over our sample period. Cohorts born before 1980 have contracted substantially by 2009.

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1. Introduction

Entrepreneurship is difficult to measure, perhaps because it is difficult to define. Some empirical studies on entrepreneurship address measurement by looking at the occupational choices of people. Entrepreneurs are then identified as those that are self-employed or own a business. But not all those reporting these occupations square with one's notion of entrepreneurs: some work at home to be able to take care of children, are self-employed because they can't find a job, have inherited a business and have no particular intention to make it grow and thrive. This characterization of entrepreneurship may be especially misleading in certain developing countries, where many of the "self-employed" are actually people who don't have a chance of finding a proper job, and open up, for instance, as street vendors.[2] Given these difficulties, others study entrepreneurship by focusing on businesses that have employees, small businesses in particular. But this, too, is potentially problematic. Many small employer businesses potentially suffer from the same limitations or prospects as self-employed businesses. In a related manner, recent studies have begun to emphasize the importance of distinguishing between business size and business age. As highlighted by Haltiwanger, Jarmin and Miranda (2013), the job creating prowess of small businesses in the U.S. is mostly accounted for by the contribution of entrants and young businesses that are typically small. The evidence for the U.S. shows that small, mature businesses have on average negative net job creation.

In this paper, we study the characteristics and growth dynamics of young employer businesses, and the contribution of these businesses to aggregate growth, in a developing economy: Colombia. Our study covers the 17 years between 1993 and 2009. When possible, our findings are contrasted with similar characterizations for US data. Given data availability on the Colombian side, we limit our attention to employer businesses in the manufacturing sector. Data limitations also imply that we abstract from micro employer businesses, limiting our study to plants of 10 or more employees (and some with less employees but large production.[3] In this respect, our study is neither about the businesses without employees or micro employer businesses. But as will become clear, we find that even with these restrictions both business size and business age are important determinants of growth in Colombia.

The paper makes several contributions to the existing literature. First, it characterizes young business dynamics for a developing economy. Many of the barriers that keep some young businesses from thriving, such as scarce access to credit and lack of experience dealing with regulations, are likely exacerbated in developing economies. These economies are frequently characterized by less developed credit markets, more cumbersome regulations (from starting a business to importing machinery), more corruption, and poorer market institutions and infrastructure. In the case of Colombia, moreover, the segment of older plants was established under a more regulated environment than that of younger plants. A second contribution of the paper is that we characterize the role of business age while also taking into account the role of business size. As will become apparent, we find substantial differences in patterns by business size holding business age constant.

[2] Schoar (2010) has classified these as "subsistence" entrepreneurs which is a term we use in this paper.

[3] Even though we face this size threshold for our sample, our measure of establishment and firm age is not based on the first time an establishment crosses this size threshold but rather on a direct measure of when the establishment began operations.

The nature of our work in this paper is descriptive: we characterize young manufacturing plants and compare them to older ones. This characterization covers several dimensions of business performance: employment, output, exports, survival patterns, productivity and investment. We also examine how these age patterns differ by plant size. We contrast these patterns with those observed in the US. We also study the contribution of establishments of different ages to overall employment and output growth over our 17-year period.

Our baseline analysis is conducted at the plant level. However, as recent work by Haltiwanger, Jarmin and Miranda (2010) has shown that it is quite important to distinguish between firm and establishment age and size in the U.S., we also reproduce our exercises at the firm level. We construct a measure of firm age based on the age of the older plant owned by the firm in the first year a new firm comes into existence (and then the firm ages naturally from thereon). As will become clear, while this distinction between firm and establishment characteristics is very important in the U.S., it is less so in Colombia. The reason is probably that in the U.S., the very large, multi-establishment (often multi-national firms) account for a much larger share of economic activity.

Younger establishments, perhaps not surprisingly, are found to be smaller than older ones. Despite this fact, and because the fastest growing among the young grow very rapidly, they are the drivers of aggregate employment growth over a period of around 15 years. Over our sample period, in fact, employment by older establishments contracts dramatically, while younger plants more than compensate for this contraction, explaining aggregate employment growth. Younger manufacturing plants are also more productive and invest more. Though they export less frequently than older ones, the probability of exporting by our young but not micro establishments is far from negligible, and the export share of younger plants is larger than that of older ones.

In the U.S., the evidence is that young businesses exhibit an "up or out" dynamic. That is, many young businesses fail, but conditional on survival they exhibit higher growth than their more mature counterparts. Though in Colombia we find roughly similar evidence, relative to the US Colombian young businesses outperform the old ones by much more.

One interesting question is to what extent the high performance of young plants is concentrated in the small establishments, given that they are over-represented in the younger age categories. This question is also important given the focus on SMEs for government support to businesses. Two interesting findings emerge from our analysis in this respect. First, in any age category, including the younger ones, larger continuing plants grow at faster rates. Second, despite the former finding, in aggregate and over our 16 year period, it is the small-young plants that contribute the most to total employment growth. This is because entry is concentrated in small plants, so that their large numbers compensate for their small size. Moreover, not only small young plants contribute the most to aggregate employment growth, but the older cohorts destroy very large numbers of jobs over our sample period, with this contraction being concentrated on the larger businesses. The role of age is crucial: it is not all small businesses that create jobs, but specifically the young and small ones.

The paper is divided into 8 sections, including this introduction. Section 2 places this study in the context of the literature and of related policy discussions. Section 3 discusses data and measurement issues. Sections 4-6 present our results: establishment size and growth by age and size in section 4, contribution of different cohort to aggregates in section 5, and plant performance in section 6. Section 7 undertakes a

preliminary analysis of how cross-sectional differences in life-cycle patterns correlate with differential degrees of exposure to regulations relevant for business entry and growth. Conclusions are presented in Section 8.

2. Policy context and related literature

Part of the policy debate on fostering entrepreneurial initiative has focused on support to small employer businesses. There is heated discussion about the potential role of these businesses as engines for economic growth and, in particular, about the gains from public support to small employer businesses. While some view small employer businesses as important drivers of aggregate growth, needy and worthy of public support, others point that small employer businesses are a too small and inefficient part of the economy to be able to drive aggregate growth. The fact is that the first of these views frequently guides small business policy, despite criticism by those on the other side of the debate. To give just one example, the existence of government agencies devoted to helping small businesses be built and grow is prevalent around the world.[4]

There are strong arguments in favor of both views. Small businesses create on net more jobs than larger ones in the US (Neumark, Wall and Zhang, 2009), and there are plenty of success stories about the Microsofts and Apples that started off as small businesses. It is also the case that small businesses face greater barriers to thrive than their larger counterparts: they do not have large administrative departments to deal with regulations, access to credit is more difficult for them, and so on. There is an implicit association between small businesses and entrepreneurship in this view: small businesses are seen as entrepreneurial initiatives that have not yet fully flourished, and that may be facing important barriers to get there.[5] To the extent that the latter represent market failures, government support to small businesses would be justified.

Critics counter on similarly strong grounds. Even in the U.S., the typical small business is inefficient and stagnant: does not grow in any significant manner, does not invest in innovation, and in fact does not even pursue growth (Hurst and Pugsley, 2011). The same authors document that small businesses are typically started by people who seek objectives such as being their own bosses or having a flexible schedule, and thus never try to grow. In short, what this side of the literature suggests is that the typical small business is not a promising endeavor which has not yet grown to its full potential, but rather a likely inefficient productive unit that does not seek to grow or innovate, but exists for potentially non-pecuniary reasons. Though perfectly valid as a life plan, this is probably not the kind of endeavor the government should be subsidizing as a strategy for taking a country's growth to its potential. It has also been widely documented that there is a positive association between size and efficiency (Olley and Pakes, 1996, and a large literature following). If the larger establishments are also the more productive ones, then aiding small businesses introduces distortions that favor the least efficient, deviating productive resources from their most productive uses (unless, of course, the policy is designed to offset an existing market failure disproportionately impacting small business, as noted above). Moreover, small establishments represent only a small share of production, exports and employment, so that focusing resources on those

[4] The Small Business Administration in the US, and the Mipymes administration in Colombia are just two examples.
[5] The Mipymes administration in Colombia aims at promoting micro and small businesses on the grounds of their "vocation for employment generation … and the entrepreneurial capabilities of Colombians" (Law 590 of 2000)

establishments helps a very small share of the economy's employment and could bring only modest aggregate gains.

A related set of concerns have emerged in the development literature. As noted, Schoar (2010) highlights that most self-employed individuals in developing economies are "subsistence" entrepreneurs. However, she notes that this does not rule out the importance of "transformational" entrepreneurs, whose projects may be sources of jobs and productivity growth. In a related fashion, Hsieh and Klenow (2012) explore the life cycle dynamics of plants in Mexico and India relative to the U.S. They note that in the U.S. (consistent with the evidence in Haltiwanger, Jarmin and Miranda, 2011) young plants exhibit an "up or out" dynamic with fast growing young plants contributing substantially to growth. In contrast, they note that in India (and to a less extent Mexico) there is much entry of young plants but not much post-entry growth.

One way to reconcile these alternative views, whether in the U.S. or in emerging economies, is to take into account the enormous heterogeneity across businesses, especially young businesses. Haltiwanger (2011) shows that, while in the U.S. the typical or median young business has low growth, average growth is high for young businesses because of a small fraction of very rapidly growing young businesses. That is, the 90^{th} percentile of the growth rate distribution for young businesses is very high in the U.S..

The working hypothesis that emerges from this review of the literature is that one should not expect all small or all young businesses to grow and indeed might expect that most will not. From this perspective, what may distinguish countries is the extent to which the upper tail of the growth distribution for young and small businesses represents rapid growth. An interesting obvious question that also emerges relates to the reasons behind cross-environment differences in this upper tail.

We contribute to this growing literature by further exploring the above issues for a developing economy, where young businesses likely face a host of additional challenges that make it unclear that the patterns of rapid growth for successful young business found in the US should be expected. The Colombian case is also interesting in that the older businesses were born before the introduction of wide market reforms at the beginning of the nineties; younger businesses must then position themselves in the market in a more competitive environment, which likely pushes them to seek greater efficiency to be able to survive and grow than similarly young plants did in the pre-reform era. We conduct a preliminary exploration on this possibility in the data, and of other potential sources of cross-sectional variation in patterns of growth over a plant's life-cycle. Our data also allows us to characterize establishments in terms of performance over dimensions other than employment, and plants' contributions to aggregates.

As noted, we are abstracting from businesses without employees and also miss dynamics of micro employer businesses. In this respect, we are not about the informal sector. Abstracting from the informal sector has advantages and disadvantages with respect to the literature. The advantage is that we avoid some of the difficulties of associated with confusing self-employed with entrepreneurial activities that have most potential for growth. The disadvantage, of course, is that one misses an important part of the action. Micro-establishments in Colombia are thought to represent close to half of the aggregate manufacturing employment. A similar participation is estimated for informal employment in the country's total. Moreover, small and/or informal businesses are probably hit hardest by many of the underlying distortions that affect growth.

3. Data and measurement

We use data from the Colombian Annual Manufacturing Survey. The survey covers all manufacturing establishments belonging to firms that own at least one plant with 10 or more employees, or those with production above a level close to US$100,000—though it is the employment limit that binds for most plants included in the survey. The unit of observation in the survey is the establishment, each of which is assigned a unique ID. This allows us to follow establishments over time.[6] It is important to mention that a plant's ID is not modified with changes in ownership. As a result, changes in ownership are not mistakenly identified as births and deaths.

Surveyed establishments are asked to report their level of production and sales, as well as their use of employment and other inputs, and their purchases of fixed assets. With information about output and input use, measures of productivity can also be constructed. Sector ID's are also reported. The sector classification changed from ISIC revision 2 to revision 3 in the middle of our sample period, but it is possible to make correspondences between the two classifications at the 3-digit level of revision 2. We thus use 3-digit codes of revision 2 to identify sectors.

Importantly for this study, since 1992 plants report their initial year of operation. We use that information to calculate an establishment's age in each year of our sample. The information on initial operation year seems in general trust-worthy: the variable is well populated, and the reported initial year is in general consistent over time for any given plant. In the few cases in which we do observe jumps in this report, or missing values, we fix the initial year of operation of the plant at the smallest non-missing value reported by the plant over our sample years. We note that having this direct measure of the initial year of operation overcomes the problems that would arise if used the first period of in-sample presence to characterize birth, given the minimum size threshold.[7]

We recognize that the size threshold of 10 or more employees represents a data limitation such that we cannot provide insights into the dynamics of micro employer establishments in Colombia. As noted, one offsetting factor is that this size threshold does not distort our measure of establishment and firm age. In addition, our imposed focus on non-micro establishments arguably also brings advantages by focusing our attention on establishments that have the greatest potential to grow, since much of the literature has found that the micro establishments are typically neither high growers nor high contributors to aggregate growth. We note that, the contribution of those micro that establishments end up constituting a source of

[6] Though there have been some changes in the coding of plant IDs over time, the last of those changes occurred in 1993. Starting in that year, plants can be easily followed with little—arguably none—error margin.

[7] We also note that we have the firm identifiers for all the establishments and thus can measure firm size and firm ages. Firm size is straightforward – that is for each establishment, we can compute the size of the parent firm in each year by adding up the employment of all its establishments. For firm age, we follow the procedure used by Haltiwanger, Jarmin and Miranda (2013). The challenge for measures of firm age is that firm identifiers may change due to changes in ownership and other organizational changes. But since we know the age of establishments in a firm, we follow this earlier work by initiating a firm's age, when a new identifier comes into being, as the age of the oldest establishment related to that firm identifier at the time of its first appearance. Moreover, this earlier work then has the firm age naturally as long as it exists even if there is a change in the age composition of establishments. Note that this approach has the advantage the young firms or firm startups in particular will be defined only when a new firm has all new establishments. We note that Haltiwanger, Jarmin and Miranda (2013) do not face the size threshold constraint in the Colombian data. In what follows, we show what happens if such a size threshold is imposed on the U.S. data.

growth will be captured by our data as soon as they cross the 10 employee threshold (and/or revenue threshold).

Figure 1 reports the distribution of plants' initial year of operation calculated over our pooled sample (126,203 observations). A very large fraction of observations in our sample (close to 40% of them) correspond to establishments born in the eighties, while another 40% of observations correspond to even older establishments. The remaining 20% of the observations correspond to relatively young establishments, born sometime during our period of observation. As we will show, despite this relatively modest presence of young establishments in numbers, their contribution to aggregate growth over both the short and the medium run is quite important.

Since 2000, establishments also report the share of their sales that corresponds to exports. Besides being available for only a subset of our sample years, however, there are concerns with the quality of exports data in the EAM.[8] Thus, we also merge customs data on exports by firms. These correspond to administrative data recorded by the tax and customs administration. The information covers all firms in the economy, and can be merged by DANE with the EAM data, using firm IDs present in both data sources. Export shares obtained from this merge must be considered upper bounds for the true values.[9]

The Manufacturing Survey offers advantages to address the issues we set out to investigate in this paper. First, there is information on actual startup year for the establishment, so we do not mistakenly assign a change of ownership or a new appearance in the survey as a birth. Moreover, the survey corresponds to a census of all manufacturing establishments with at least ten employees. We can thus characterize the contribution of plants of different ages to the aggregate growth of the non-micro manufacturing sector.

4. Size, growth and turnout by age

4.1. The young vs. the older

We begin our empirical analysis by characterizing establishments of different ages according to their levels of employment and (log) output.[10] In the interest of succinctness, we classify our observations according to the age of the plant using four categories: 0-4 years (6.5% of observations), 5-9 years (14.5%), 10 to 14 years (17.5%), and 15 years or more (61.5%).

Basic descriptive statistics for the distribution of employment and output across these categories are presented in table 1.[11] The left panel of Table 1 presents unweighted statistics while the right one presents statistics weighted by employment (the same is true in Table 1 and several upcoming tables). The weights

[8] Both the number of exporting plants and their average reported exports fall importantly between 2003 and 2004. This is not consistent with aggregate trends as captured by other data sources.

[9] Although a potential mismatch arises because the EAM only covers manufacturing activities of the firm while the customs data reports exports both of own manufactured products and of other products (commercialization, non-manufacturing products), the results of the customs-EAM data seem plausible. Share exports calculated using customs data look very similar to those directly reported in EAM for 2000-2003 (when EAM exports data is consistent with other sources), and that less than 1% of observations show export shares above 1. We note that the results reported truncate the distribution of export shares in 1 (all export shares above 1 are converted into 1).

[10] The latter is revenue for the establishment deflated by an industry deflator. See discussion below for more details.

[11] The results described in this section do not change significantly if sector and year effects are controlled for.

in this panel are the shares of total employment in the respective age category represented by each observation. These employment-weighted statistics can be interpreted as representing the establishment in which average—or median, or 10th percentile, etc—employee works.[12] Differences in means between different age categories are generally statistically significant in this table.

The left panel of Table 1 shows that younger plants are smaller, despite the fact that the survey does not cover micro establishments. For instance, the average plant aged 5-9 years is four to five employees (or close to 10%) larger than that aged 0-4 years. Another five employees are added to the average plant over the following five years. Even older plants are significantly larger. In turn, the average employee (right panel) works at a plant that is 10 employees (5%) larger if it was born 5 to 9 years ago than if it was born over the past five years (right hand upper panel), and more than twice as large if the plant was born more than 15 years ago. Production similarly grows with age. Younger plants are more likely to exit than older ones (bottom panel). While one could have expected very large exit rates for just-born establishments driving this decreasing pattern of exit rates, the larger differences are not concentrated in the very first few years after birth. That is, 5 to 9 year old establishments have about the same exit rates as the 0-4 year old establishments. All of the discussed mean differences across categories are—at least qualitatively—reproduced along the distribution: all reported percentiles are larger for categories of older plants.

Does the fact that young plants are small mean that they are also typically stagnant, as the typical small establishment (Hurst and Pugsley, 2011)? The answer is a resonant no.

Table 2 reports descriptive statistics for the distributions of employment growth and output growth.[13] We calculate growth rates using the symmetric growth rate approach suggested by Davis, Haltiwanger and Schuh (1996), where the denominator of the growth rate is the average rather than the initial level:

$$g_{X,i,t} = \frac{X_{i,t} - X_{i,t-1}}{\left(\frac{X_{i,t} + X_{i,t-1}}{2}\right)}$$

These growth rates, to which we refer as DHS growth rates (for Davis, Haltiwanger and Schuh (1996)), also have the nice property of accommodating exit and entry, and treating them symmetrically. In particular, DHS growth rates are bound between -2 and 2, where -2 is the growth rate for an exiting unit and 2 is that for an entering unit. The use of a symmetric growth rate helps avoid the biases present with the traditional growth rate. [14] While Panel A in these tables presents growth rates pooling continuing, entering and exiting establishments, Panel B covers only continuers, and Panel C adds exit. The weights being used in the right-hand-side panels are given by average employment between t and t-1.

[12] Notice that, by construction, these statistics are calculated "counting" each observation as many times as employees the plant has in that year.

[13] The weighted mean of employment growth in this table reproduces, by construction, the growth rate of the respective categories.

[14] Standard growth rates (where the denominator is the initial level) have the property that if a business goes from 100 workers to 50 workers and then back to 100 workers then the average growth rate will be positive (-.5+1=.5) even though the business is the same size in the beginning and end year. Symmetric growth rates such as DHS and log first differences don't have this property. DHS growth rates have the advantage relative to log first differences of being able to accommodate entry and exit.

Table 2 shows that both employment and production growth generally decrease with age. This is true independently of whether exit and entry are taken into account. The only exception occurs in panel C, where the very oldest plants show stronger growth than middle aged ones thanks to lower exit rates. Differences in growth rates across age categories are, in general, statistically significant.

For continuers, employment in the category of plants ages 0-4 grows at a mean rate of 6% annually, while for plants aged 15 years or older it actually contracts modestly (panel B, right side panel). Similarly, output grows in continuing establishments younger than five years by 16% on average for continuers, compared to 2% for the category of oldest plants. While exit erodes much of this growth for young plants (panel C), it has a similar effect on older plants. Moreover, for young plants destruction from exit much is more than compensated by entry: weighted employment growth of the youngest plants jumps to 36% when considering both entry and exit (panel A). [15] We come back to comparisons between continuers and exit further below.

While the whole distribution of growth is shifted to the right for younger plants, the bulk of the aggregate and average growth difference is concentrated in the highest percentiles. That is, it is the fastest growers among the young that drive most of the more rapid aggregate growth in those early ages. Figure 2 shows this pattern for continuers on an employment weighted basis: the 90th percentile decreases rapidly with age, while the 10th one is not that different across age categories. Still, back to Table 2, it is clear that even at the median there is a sizeable decrease from younger to older categories. The different patterns for the 90^{th} and 10^{th} percentiles help highlight that young plants exhibit both more dispersion and skewness in growth rates.

Interestingly, despite the potential greater presence of barriers to the growth of young businesses in the Colombian economy, in many respects these growth patterns are similar to those observed in previous work for the US. Figure 3, taken from Haltiwanger (2011), displays the 10th and 90th percentile of employment growth for the whole population of continuing private firms in the US (that is, including firms from all sectors of the economy and of all sizes). As in the Colombian AMS data, the 10th percentile is similar across ages, while the 90th decreases markedly as age goes up. Two basic messages are clear in both the US and the Colombian data from these 10th-90th gaps: there is great heterogeneity of growth among the young plants. Moreover, the fastest growing ones among the young plants are main drivers of employment growth in that age category. Though appropriate caution is needed in comparing the firm growth rate distributions with the establishment growth rate distributions, out results do not change significantly if we compute these statistics at the firm rather than the plant level. We conduct some preliminary exercises below to address this issue.

In previous work for the US, however, rapid growth by some young continuing establishment has been found to be balanced off by rapid exit by the least successful among young plants. Figure 4 illustrates this pattern, based on data from the Business Dynamic Statistics of the U.S. Census Bureau, covering all US establishments. In any panel, the red (blue) bars correspond to growth by continuers (exiters, in absolute

[15] Entry to the survey can occur at ages beyond 0, if a micro establishment grows beyond the size threshold for inclusion. This implies that part of the growth attributed to entry in these tables (the difference between panels A and C) corresponds to growth by continuers that were micro establishments the previous year. The fact that including entry shuts growth rates up mainly for plants in the younger age categories means that many of these plants transit out of the micro category in their first ages.

terms) as a proportion of employment in the respective age category. The upper left panel replicates a figure in Haltiwanger (2011) (left upper panel), showing what the author calls the "up or out" dynamics for young US firms: while young continuing businesses create employment at rapid rates, there is even higher destruction of employment by young exiting businesses. In fact, overall in the US the just-born (age=1) firms category is growing more rapidly than any other category between 2 and 15 years (Haltiwanger, Jarmin and Miranda (2013)). The other panels of Figure 4 progressively restrict the US sample to finally match the characteristics of our Colombian sample: plants (rather than firms) with 10 or more employees, in the manufacturing sector.

Comparison across panels of Figure 4 show interesting insights about business dynamics by age groups. First, if the US sample is not restricted to the group of non-micro firms (as in the bottom left panel), the younger plants cohorts look less healthy: continuers grow less and more employment is destroyed by exit than when micro plants are excluded. This suggests that, in fact, micro startups tend to be less successful; less "entrepreneurial" as we have called them. Due to the nature of the Colombian data, we cannot directly observe this pattern in Colombia, but it seems plausible that the same pattern would hold.

Also, a comparison between the upper left panel of Figure 4 and the rest of panels shows that, in the US, there is more destruction from exit and also healthier growth by continuers at the firm rather than the plant level. It seems that US firms tend to replace older inefficient establishments with new ones. In fact, the recent work of Haltiwanger, Jarmin and Miranda (2010) has shown that it is quite important to distinguish between firm and establishment age and size in the U.S.. They find for the U.S. that most new establishments are part of new firms but that most new establishments of existing firms are for older firms. That is, older firms re-invent and restructure themselves in part through adding new establishments.

Figure 5 reproduces this exercise using our Colombian data (upper left side panel), and extends it to the dynamics of output and the capital stock. Comparing the employment panel of Figure 5 with the comparable panel of Figure 4 (lower right panel) shows interesting differences between the US and Colombia. The strongly decreasing pattern of destruction from exit over age categories that we observe in the US Figure is not reproduced by the Colombian data. Moreover, growth by young continuers in Colombia is also higher than in the US. The younger in the Colombian sample look, relative to the old, healthier and more dynamic than their US counterparts.

Interestingly, the phenomenon of old firms boosting growth by dropping old establishments and adding new ones does not seem prominent in the Colombian data. Figure 6 shows that, in Colombia, growth patterns across age categories do not present much difference if calculated at the firm or the plant level. It is especially striking that the relatively high rates of exit for older Colombian plants carry over to relatively high exit rates for relatively older firms. In addition, one might have thought that exit rates for young firms would be higher than those of young establishments (since the latter can be part of older firms). But we see little difference. Though multi-plant firms represent only 3% of the total number of firms, at a 19% of total employment they are sufficiently important that from a purely accounting perspective it was not fully expected that moving to the firm level would have such little impact on calculated growth rates. This may suggest that multi-plant firms in Colombia, though large compared to the rest of Colombian firms, are nothing like the larger of US big corporations. We plan to explore this issue further in future versions of this work.

4.2. Is it age or size?

Is age simply proxying for size in our previous figures? Table 3 shows that it is indeed the case that small establishments are over-represented in the younger age categories: while pooling across ages small establishments represent close to 16.6% of all employment, for plants aged 0-4 years the figure more than doubles. In what follows, we explore age-size cross patterns. On the other hand, only 7.22% of all small-plant employment in the survey is concentrated in the young ages. Following Colombian legal standards, small plants are defined as those with 10 to 49 employees, medium ones have between 50 and 249 employees, and large plants have 200 or more employees.

Figure 7 shows the mean of the distribution of DHS growth rates for continuing establishments, separating plants into small, medium and large according to their average employment levels between t and t-1. Two interesting features appear. First, while both age and size matter for growth, differences are much more marked along the age dimension than along the size dimension. As before, mean differences are driven by the fastest growing: 90th percentiles of growth rates differ significantly across ages, but 10th percentiles do not (Figure 8). (The full distribution of DHS growth rates is presented in Table A1, following the same conventions of Table 2.)

A second finding from Figure 7 is that, for any age category, it is the larger plants that exhibit higher growth rates. This is contrary to the view that growth is driven by small firms: in the Colombian manufacturing sector it is indeed the young that grow faster than others but, among them, the larger projects are more dynamic. In fact, in these data small continuing plants contract, except for the youngest ones.

Overall, age is a more important determinant of growth than size is and, controlling for age, large establishments grow faster than small ones. The latter statement, however, does not mean that small establishments are irrelevant for growth. First, notice that there are very rapid growers among small continuing establishments (Figure 8). Moreover, the contribution of plant entry is most important for small-young establishments. The average growth rate of small plants aged up to four years jumps from 4% for continuers to 53% when considering entry and exit, and despite very important destruction from exit (table A1).[16]

The left-most group of columns of table 4 ("All ages") shows that, on aggregate, small and medium establishments grow sufficiently fast that, in any given year, close to 20% of all large establishments (and 6% of employment in large establishments, see panel B) are represented by plants that started off small or medium four years before. More interesting, this dynamic contribution of SMEs to growth is much more marked for young establishments (second to fourth groups of columns, from left to right). The fraction of large establishments (employment in large establishments) in t represented by plants that were small or medium in t-4 is 40% (15%) among those aged 0-4 years in t, but only 17% (5%) among plants aged 15 or more years. (Cells not sufficiently well populated to satisfy confidentiality restrictions are left blank in these matrices.)

[16] We note that the patterns in this section are robust to using firm size and firm age rather than establishment size and age.

5. The contribution of young businesses to aggregate employment

We have documented that younger businesses in our sample grow faster than older ones, but also that they are smaller and that their high average growth rate hides a fair degree of heterogeneity. Do small size and a relatively small number of very fast growing plants imply that young businesses actually do little in terms of generating aggregate employment?[17]

We tackle this question in Table 5. For specific years of our sample (1994, 1997, and so on), the Table decomposes aggregate employment in the AMS into the contribution of establishments of different birth cohorts. A cohort is defined by the year reported by the plant as its initial year of operation. Thus, for instance, the top row of Panel A shows that around half of the employment covered by the Survey in 1993 corresponded to workers in plants born before 1970.[18]

It is in general the case, for any of the years reported in the table, that most of the employment is concentrated in plants born before the eighties. Less than 5% of employment in any given year is represented by plants born in the previous three years. This large weight of older establishments in total employment reflects the fact that older establishments have more workers (Table 1), reinforced by the fact that some plants only enter the survey a few years after they are born (i.e. when they reach the size requirements of the survey).

What is interesting, however, is that despite young plants representing only a small share of total employment, they contribute the bulk of net employment creation over the 16 year horizon covered by Table 5. In fact, everything else equal, manufacturing employment would have collapsed in the absence of entry. While total employment in the AMS grew by more than 7,000 jobs between 1993 and 2009, this overall growth hides very diverging patterns by older and younger plants. Total employment by establishments born before 1985 shrank dramatically, by more than 160,000 jobs. Meanwhile, employment by plants born in the more recent years grew, and it did it sufficiently to overcome the contraction of employment at older establishments.

Behind the contraction of employment at older establishments are very large exit levels by these age categories: more than 30% of the plants present in the survey in 1994 that were born before 1990 had abandoned the sample by 2008 (Panel B). This is in consonance with Figure 9, showing that old plants exit at high rates despite any potential incumbency advantage. Notice that it is in fact exit that explains

[17] Notice that our employment-weighted statistics in Tables 1-3 do not get at this question, as weighting is done within age categories.

[18] Total employment reported in this table is not identical to the official report of employment by non-micro manufacturing establishments produced by DANE for most years, but gets very close to that report. The minor differences are due to missing values in the reports of initial years of operation, to the exclusion of oil and coffee processing, two sectors where production is concentrated in a very large public-private company, and to our inclusion of the apprentices in the count of employees. This category was created by law and included in the survey since 2003. DANE does not include apprentices in its reports of total employment, in principle to keep consistency with previous years, when mandatory apprentices were not reported (because they did not exist). We chose to include these workers because they are paid formal workers, and because it is likely that there was substitution of other types of workers, so that ignoring them may lead to an apparent and incorrect contraction of total employment figures. Though the overall employment level is in fact lower by about 13,000 employees when not including apprentices, the relative contribution of different cohorts on which we focus is robust to the exclusion of apprentices.

why total employment by old establishments shrinks in such a dramatic way: within-plant employment at the average continuing old establishment in fact grew, though at a very modest annualized rate of less than 1% (Panel C).

Meanwhile, a very large number of establishments born after 1990 were included in the AMS over the years of the sample. This includes both establishments born already beyond the 10 employee (or the production) threshold, and plants that were born (after 1990) at a smaller size, but that grew rapidly enough to make it into the sample a few years after their birth. It is these entering businesses that generated enough employment to compensate for the exit of older establishments and yield some aggregate net job creation.

Overall, what these findings indicate is that young establishments, despite being born small and representing a small share of non-micro businesses employment, are the key to employment growth over the medium run (represented here by the 16 year period covered in Table 6). They also contribute disproportionately to the growth of production (Panel D).

How do these cohort contributions to aggregate growth differ by size categories? Table 6 attempts at answering this question by splitting each cohort into the contribution of plants of different sizes. (The "Large" category is not reported for the cohorts where it is not sufficiently populated to satisfy data confidentiality restrictions). Two interesting features emerge. First, in the recent cohorts it is the small establishments that contribute the most to medium term aggregate employment growth. This is because the overwhelming majority of new establishments are born small. That is, the advantage of small establishments in numbers overcomes their size disadvantage in terms of contributions to overall employment growth. A second interesting finding is that the collapse of aggregate employment in the very oldest cohorts is driven by the destruction of employment at large establishments. In the case of these cohorts, though more small and medium establishments exit the market, the large establishments lose much more jobs. Overall, what we observe is that in terms of aggregates over the 16-year term of our sample, it is smaller young establishments that are contributing the most to positive employment growth and it is the old large establishments that destroy most jobs.

This substantial restructuring within the Colombian manufacturing sector away from the oldest cohorts highlights that Colombia manufacturing plants have reinvented themselves over this period through entry of new establishments, post-entry growth of those establishments and the exit and contraction of the establishments from the oldest cohorts. We note that the patterns we report in Tables 5 and 6 are largely robust to using firm size and age categories rather than establishment size and age categories. This suggests this restricting of Colombian manufacturing is not simply large, old firms shutting down old establishments and opening up new establishments but rather between firm restructuring.

The distinction between within firm vs. between firm restructuring matters much more in the U.S. For example, in 1994 in the U.S. the plants that were part of the pre-1977 cohort as measured by establishment age accounted for 55 percent of U.S. manufacturing employment. By 2009, this same cohort accounted for 37 percent of U.S. manufacturing employment. If this same comparison is made using firm age, in 1994 the plants that were part of firms that started before 1977 accounted for 75 percent of U.S. manufacturing employment. In 2009, this cohort of firms accounted for 64 percent of U.S. manufacturing employment. The inference is twofold. First, and not surprisingly, the share of employment accounted for by older firms is much larger than that by older plants in the U.S. Second, and

in a related fashion, the decline in the cohort share of older plants is substantially larger than for the cohort share of older firms. This distinction being less important in Colombia than in the U.S. likely reflects the much larger contribution of large, multi-national firms with many establishments in the U.S.

6. Productivity, investment and exports over the life cycle

Having documented the very important contribution of young businesses to aggregate growth in the context of the AMS, we now move to examining their basic performance. We concentrate on investment, exports and productivity indicators.

In terms of measurement, we construct investment using the reports of purchases and sales of capital goods. In particular, investment is the difference between purchases and sales of machinery and equipment, office equipment, and transportation equipment. We deflate this measure using the implicit gross capital formation deflator from the national accounts input output matrices. We ignore throughout "inflation adjustments" reported in some years, as was required by accounting laws; inflation is taken care off in our calculations by deflating investment. An investment rate is then constructed by dividing this investment measure by the capital stock at the beginning of the period (see below for construction of the capital stock).

We also estimate a log based measure of plant productivity as:

$$tfp_{it} = \ln Y_{it} - \alpha \ln L_{it} - b \ln K_{it} - \gamma \ln M_{it} - l \ln E_{it}$$

where Y_{it} is plant i's output in year t, K_{it} is the plant's capital stock, M_{it} is the value of materials purchases, and E_{it} is the use of energy. The capital stock is constructed using perpetual inventory methods and the investment measure explained above. We initialize the series for each plant at the plant's reported book value in either 1992 or the first year after 1992 in which the plant reports. The initial value is then adjusted iteratively using the plant's investment level in the respective year and a constant depreciation rate specified by accounting laws. The value of materials used is directly reported by the plant, as are kilowatts of energy consumed. We deflate output and materials using the PPI for the plant's sector (2009 is our base year). The factor elasticities we use to weigh the use of different production factors are taken from Eslava et al (2004) and estimated using IV methods and downstream demand indicators as instruments.[19] Finally, we use exports from customs data, as explained in detail in the data description section.

Our use of sector level prices as deflators implies that our measure of productivity is closer to what has been lately denominated as "TFPR": a revenue-based measure of productivity that mixes technical efficiency and firm or establishment-level variation in prices. Eslava et. al. (2004, 2012) find that, consistent with models of producer-level product differentiation, high technical efficiency businesses have lower prices within the same industry. This is intuitive as high productivity producers in a technical efficiency sense have lower marginal costs and should charge lower prices as they move down their demand schedules. As discussed in this work, appropriate caution is needed in interpreting variation in

[19] Other approaches to estimating factor elasticities, such as using cost shares, or the Levinson-Petrin and Olley-Pakes semi-parametric approaches yield TFP estimates that are highly correlated with the TFP measure we are using. Eslava et al. (2012), for instance, report a correlation coefficient of 0.9 between TFP calculated using the factor elasticities we use here and a similar measure using cost shares to estimate factor elasticities.

TFPR (but note that our earlier work indicates that the correlation between TFPR and technical efficiency or what has been called TFPQ is reasonably high around 0.70).

Table 7 reports basic descriptive statistics for these measures of performance, for the same age categories reported in Tables 1-2. (As in those tables, the results we report are robust to taking out sector and year effects.) Interesting differences across ages are found. Younger plants invest more as a fraction of their initial capital, and are more productive. This is true even after taking out time and sector effects. The differences are quantitatively important: controlling for sector and year effects, the youngest category of ages shows an average investment rate of 1.10, while the analogous figure for the oldest category of ages is of only 0.56. For (revenue) TFP, the youngest category shows TFP about 7 log points higher than that of the oldest businesses. Higher TFP is concentrated in the ages of 0-4 years: only the differences between this category and the other three are robustly statistically significant. It is also the case that it is the most productive among the young businesses that drive the gap with respect to older ones: it is the 90th percentile where greatest differences are found. So, it is not simply that all young are born with better technology, but only the best among the young.

Higher productivity for young businesses is also reflected in Table 8, where TFP is regressed against a quadratic age polynomial, with the correlations allowed to vary depending on whether or not the plant exits in the current year (the plants reports positive production in the current year but not in the next). Our TFP measure clearly decreases with age. Exiting is concentrated in lower TFP plants, the exiting TFP being lower the older is the establishment that exits.

In short, the younger plants in the AMS are more productive than the older ones. This is consistent with vintage capital models, where the young plants invest in the newest technology, which then rapidly depreciates in terms of its technological advantage. However, it is also clear from our tabulations that not all young plants are more productive than their older counterparts. Note that given we are using TFPR instead of TFPQ it could be that younger plants are charging higher markups but all of the evidence suggests that if anything younger plants are charging lower markups.

As for exports, Table 7 shows that, not surprisingly, younger businesses are less likely to export than older ones. What may be more surprising is that in fact the probability of exporting by very young establishments is far from negligible. In the Colombian manufacturing sector, (non-micro) establishments export with a probability above 20%. The number increases about 10 percentage points for the oldest age category considered: plants aged 15 years or more. Even more interesting, the share of revenue exported by young exporters is higher than that of older ones.(Though appropriate caution must be applied to this statement, since a plant is assigned here the export share corresponding to its owning firm in the customs data.)

Overall, young establishments in our sample are not outperformed by the old, despite being smaller. This squares well with our earlier finding that these younger businesses are engines for aggregate growth.

7. Explaining differences in life-cycle patterns across plants

What is behind the life-cycle patterns described above? Are small plants inherently slower-growers than their larger counterparts, or are they rather hit harder by market failures? Similarly, what makes the fastest growing among young plants more successful than other similarly young ones? We take a first step in the

direction of answering these questions. Because of the descriptive nature of our analysis in this paper, in this section we simply go after a few natural candidate explanations of cross sectional differences in life cycle patterns.

We begin by exploring how the growth patterns documented above differ across two subperiods in our sample. Colombia underwent wide market reforms just before the start of our sample period, including large trade reform that exposed Colombian manufacturing producers to international competition, financial liberalization, and privatizations. Consequently, most plants in the early part of our sample were born before the reforms, and were thus used to a relatively protected environment. By contrast, by the second half of our sample (more than a decade after the reforms), young plants and surviving older plants were used to a much more competitive environment.

Motivated by these considerations, we compare the life-cycle patterns of performance observed in the first few years after the reforms, when the old plants had not had time to adjust to the new environment and all the young were born in that context, to those of the most recent years. This is shown in Table 9. Years 1998-2002 are excluded because the starkest recession of over 60 years occurred during that period. The years that preceded that crisis and those that followed it are arguably comparable in terms of the phase of the economic cycle that the economy was going through.

Both periods are characterized by younger plants growing much more rapidly than older ones (Table 9). Also, among continuers growth rates are higher for all age categories in the more recent period, compared to a decade ago. Interestingly, however, growth rates for the categories of older plants increased much more steeply than those of the younger plants. For instance, the (employment-weighted, and thus aggregate) growth rates of plants aged 6 years and above got multiplied by factors of 2 and above, while those of the 0-4 category grew by a smaller fraction.

Figure 9 also shows that the performance of plants born before the reform (aged 6 years and above) was particularly poor in the 93-97 period. While not conclusive, this is consistent with those older plants being relatively less efficient and taking a hard hit after the economy was liberalized. Moreover, contrasting the upper and lower panels of Figure 9 shows that there is just more dynamism in the later period over all age categories, with higher growth rates of continuers, and also healthy exit (though with less destruction by old plants that immediately after the reform).

The pattern of employment growth in the most recent period is also interesting in itself. It moves closer to the US benchmark in the sense of growth by both continuers and exiters displaying a relatively orderly decreasing pattern over age categories. In this sense, and if the US were in fact an efficiency benchmark (as interpreted by Hsieh and Klenow, 2012, for instance), the patterns of within-plant growth in the Colombian economy do seem to have moved towards that benchmark.

In future drafts of this work, we also plan to explore the extent to which differential degrees of protection from international trade (represented by time- and sector-varying tariffs), differential costs for opening and closing a business, and differential degrees of foreign ownership explain cross sectional differences in life-cycle patterns.

8. Conclusions

This paper characterizes Colombian manufacturing (non-micro) establishments over their life cycle. We find that, though older establishments are larger, it is the younger ones that show greatest dynamism. Young establishments in our sample outperform the old in a number of dimensions. First, the average young plant displays larger inter-annual growth rates than the average old plant. Second, despite the relatively modest contribution of the young to overall employment and output at any given point in time, it is the youngest cohorts of plants that explain the bulk of employment and output growth over the medium term (i.e. the 16 years covered by our sample). Overall employment by establishments 20 years and older in fact collapsed over our period of study. Finally, younger establishments, especially those less than five years old, invest more and are more productive.

That there is very dynamic growth among some young establishments has been previously documented using data for the US (Haltiwanger, 2011; Haltiwanger et. al. 2011; Haltiwanger et al. 2013). Young establishments in our sample of Colombian plants fare relatively better in terms of survival than in the U.S. Careful comparison suggests this partly reflects our inability to track micro establishments. But even after taking this into account, exit rates for young establishments in Colombia are not much higher than older establishments. This pattern is quite different than that for the U.S. While our analysis is still preliminary, we think that the results may be driven in part by the older cohorts of establishments being part of a generation of establishments that were founded in a less competitive era in Colombia. As such, we think that there has been relatively greater exit of Colombian older establishments over the last couple of decades in response to the market reforms in Colombia. That is, the patterns could reflect a "cleansing" effect of older, less efficient establishments.

References

Davis, Steven J., John Haltiwanger and Scott Schuh, 1996, Job Creation and Destruction, MIT Press.

Eslava, M. J. Eaton, M. Kugler and J. Tybout, 2008, "Export Dynamics in Colombia: Firm Level Evidence," in The Organization of Firms in a Global Economy, pp. 231-72. Edited by Elhanan Helpman, Dalia Marin, and Thierry Verdier. Cambridge: Harvard University Press.

Eslava, M., J. Haltiwanger, A. Kugler and M. Kugler (2004) "The Effects of Structural Reforms on Productivity and Profitability Enhancing Reallocation: Evidence from Colombia," Journal of Development Economics, 75 (2), 333-372.

Eslava, M., J. Haltiwanger, A. Kugler and M. Kugler (2006) "Plant Turnover and Structural Reforms in Colombia," IMF Staff Papers, 53, 58-75.

Eslava, M., J. Haltiwanger, A. Kugler and M. Kugler (2010) "Factor Adjustments After Deregulation: Panel Evidence from Colombian Plants," Review of Economics and Statistics, 92, 378-391.

Eslava M., J. Haltiwanger, A. Kugler and M. Kugler, 2012, "Trade reforms and Market Selection: Evidence from Manufacturing Plants in Colombia" Mimeo.

Foster, Lucia, John Haltiwanger, and C. J. Krizan. 2001. "Aggregate Productivity Growth: Lessons from Microeconomic Evidence." In New Developments in Productivity Analysis, ed. Edward Dean, Michael Harper, and Charles Hulten, 303–63. Chicago: University of Chicago Press.

———. 2006. “Market Selection, Reallocation and Restructuring in the U.S. Retail Trade Sector in the 1990s.” Review of Economics and Statistics 88, no. 4:748–58.

Foster, Lucia, John Haltiwanger, and Chad Syverson. 2011. The slow growth of new plants: learning about demand? NBER Working Paper.

Haltiwanger, J. 2011. Job Creation and firm dynamics in the US. Innovation policy and the economy. NBER.

Haltiwanger, John, Ron Jarmin, and Javier Miranda. 2013. “Who Creates Jobs? Small vs. Large vs. Young.” NBER Working Paper No. 16300, (forthcoming in the Review of Economics and Statistics)

Hsieh, Chiang-Tai and Peter Klenow. 2012. “The Life Cycle of Plants in India and Mexico,” NBER Working Paper.

Hurst, E. and B. Pugsley. (2011) What do small businesses do? Brookings Papers in Economic Activity.

Neumark, David, Brandon Wall, and Junfu Zhang, 2009, "Do Small Businesses Create More Jobs? New Evidence for the United States from the National Establishment Time Series", Review of Economics and Statistics, (forth).

Schoar, Antoinette (2010), “The Divide between Subsistence and Transformational Entrepreneurship,” Innovation Policy and the Economy, 10(1), pp. 57-81.

Figure 1: Birth Cohort Histogram

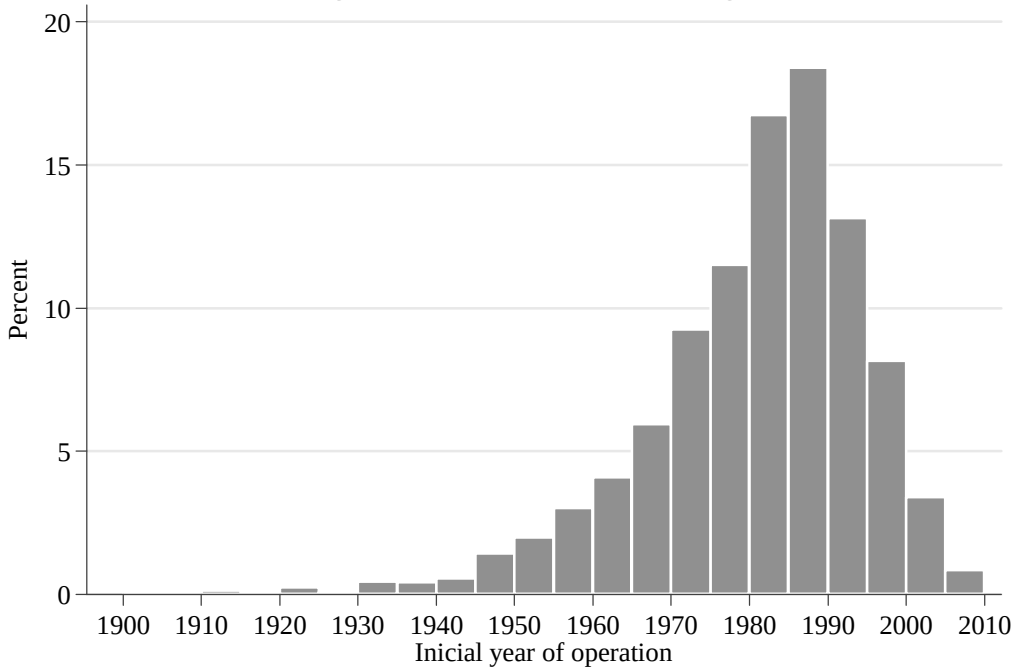
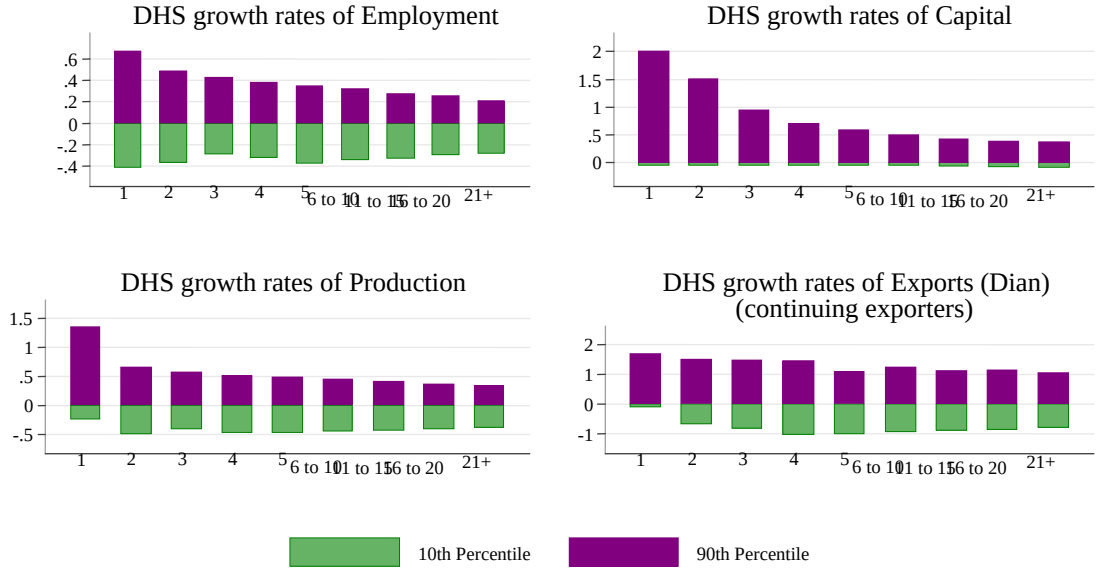


Figure 2: 90th and 10th Percentiles of Net Employment Growth Rates for Surviving Colombian establishments by establishment Age (1993-2009)
Size categorie: all
Employment Weighted



The exports from DIAN only have information until 2007
Source: EAM Dian (1993-2009)

Figure 3: 90th and 10th Percentiles of Net Employment Growth Rates for Surviving U.S. Private Sector Firms by Firm Age (2003-05)

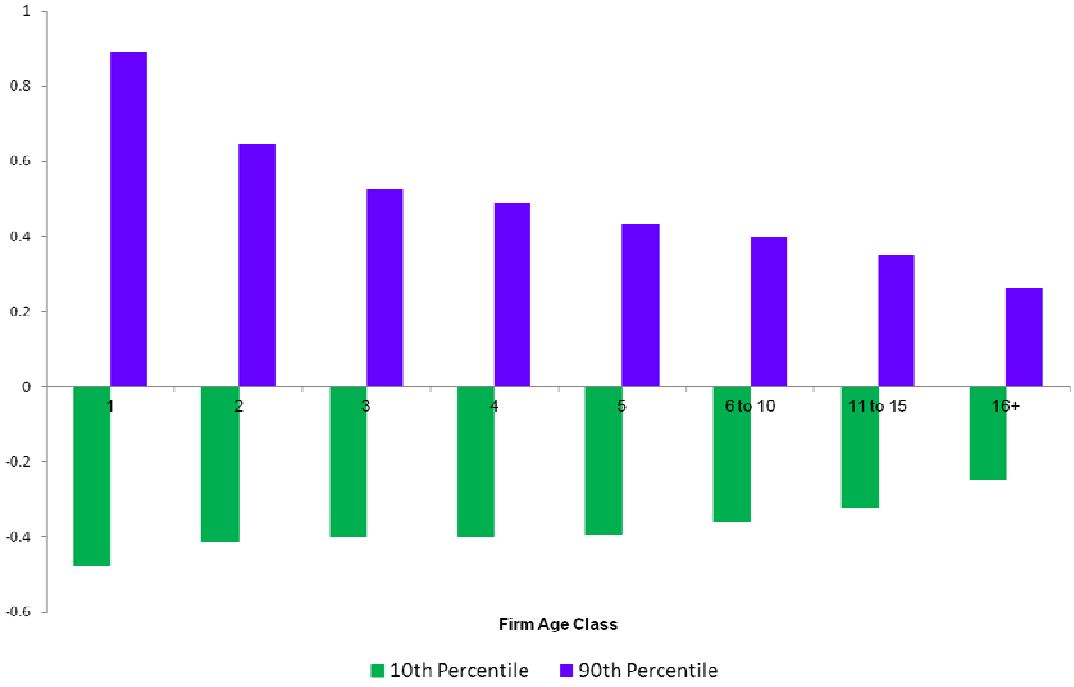


Figure 4: Up or out dynamics in the US:
by firm and by plant age, all and non-micro plants

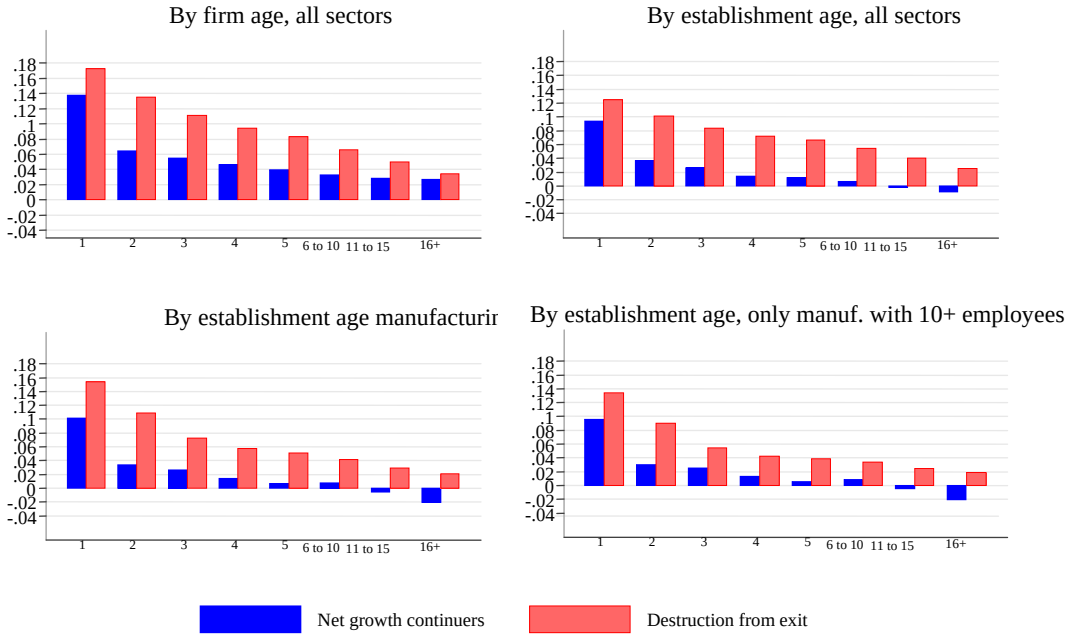
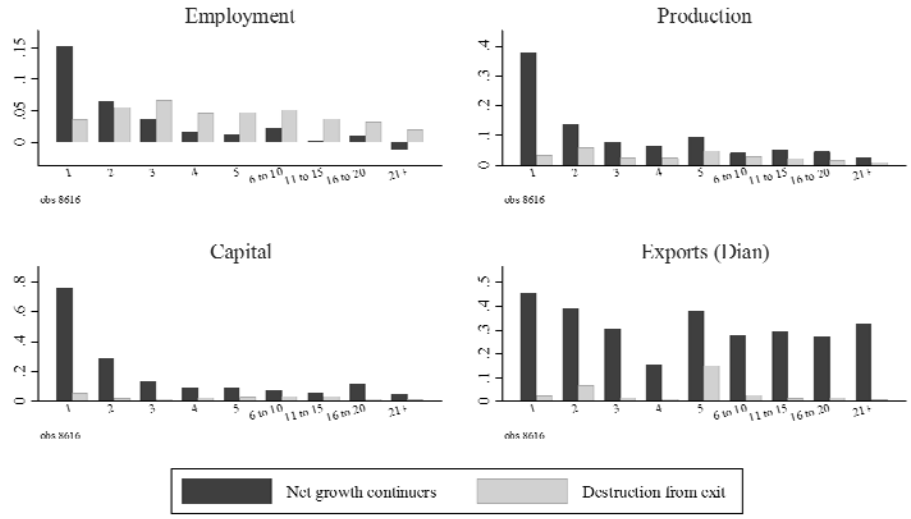
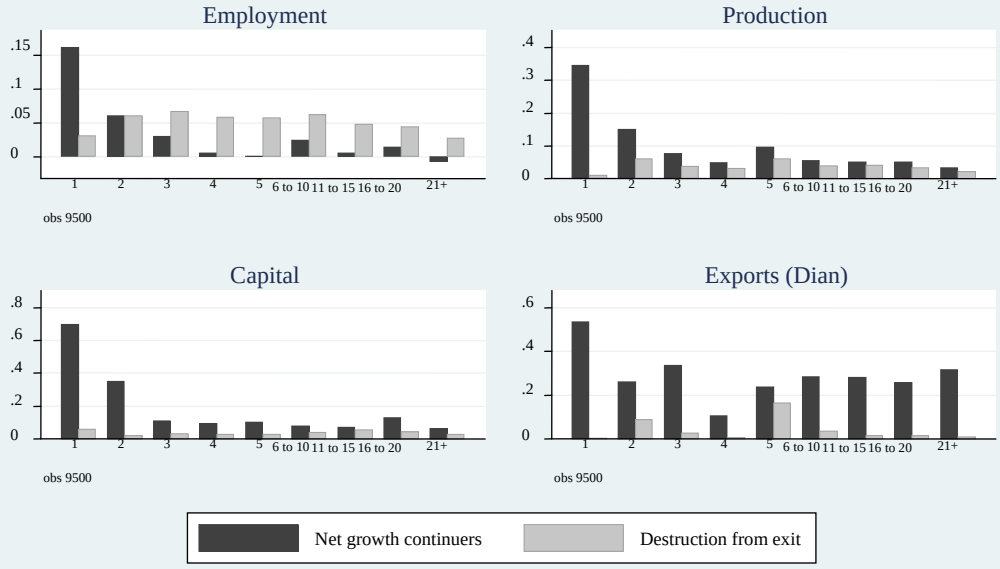


Figure 5: Up or out dynamics of young colombian establishments
Size categorie: all
1993-2009



The exports variable only have information until 2007
Source: EAM Dian (1993-2009)

Figure 6: Up or out dynamics of young colombian firms
Size categorie: all
1993-2009



The exports variable only have information until 2007
Source: EAM Dian (1993-2009)

Figure 7: Mean DHS growth rates for continuers.

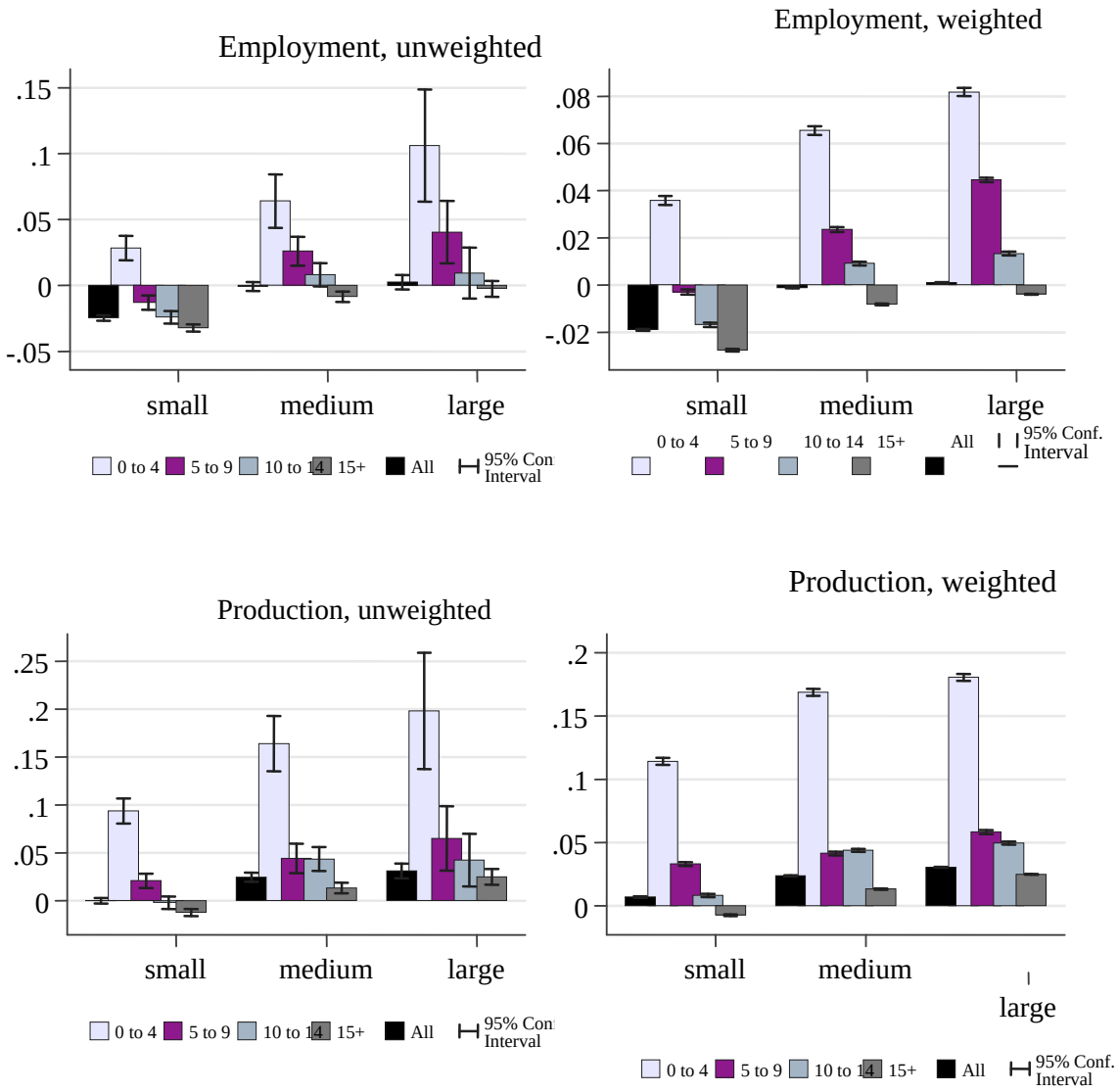
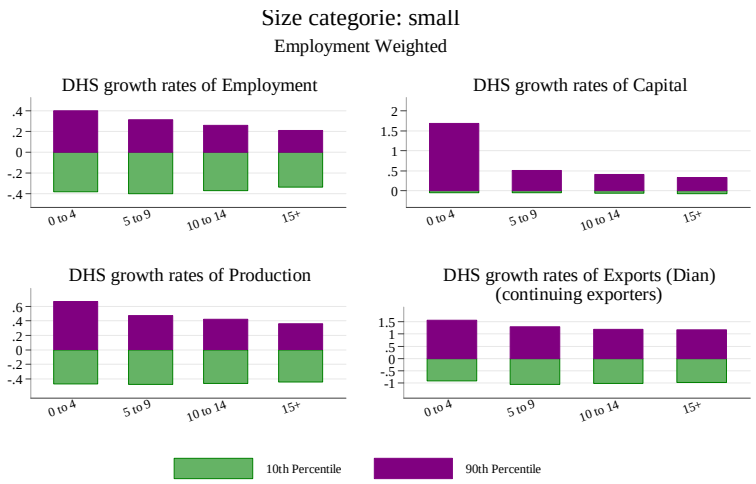


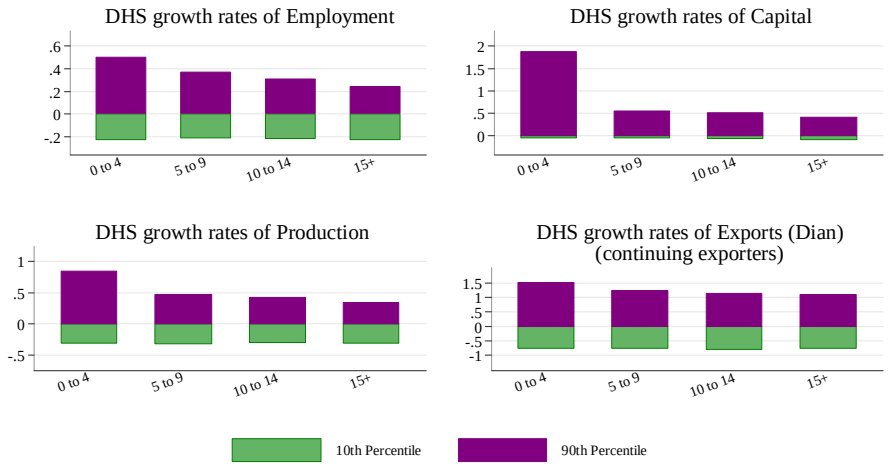
Figure 8: 90th and 10th Percentiles of Net Employment Growth Rates for Surviving Colombian establishments by establishment age and size



The exports from DIAN only have information until 2007
Source: EAM Dian (1993-2009)

Size categorie: medium

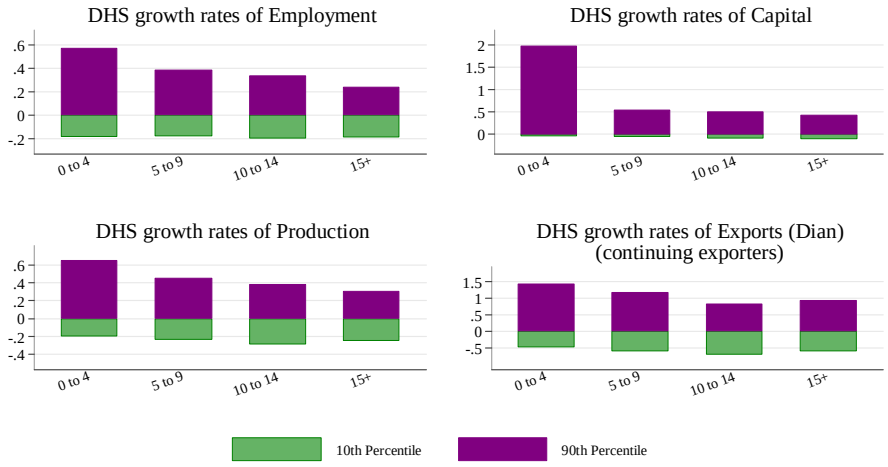
Employment Weighted



The exports from DIAN only have information until 2007
Source: EAM Dian (1993-2009)

Size categorie: large

Employment Weighted



The exports from DIAN only have information until 2007
Source: EAM Dian (1993-2009)

Figure 8: Exit by Age

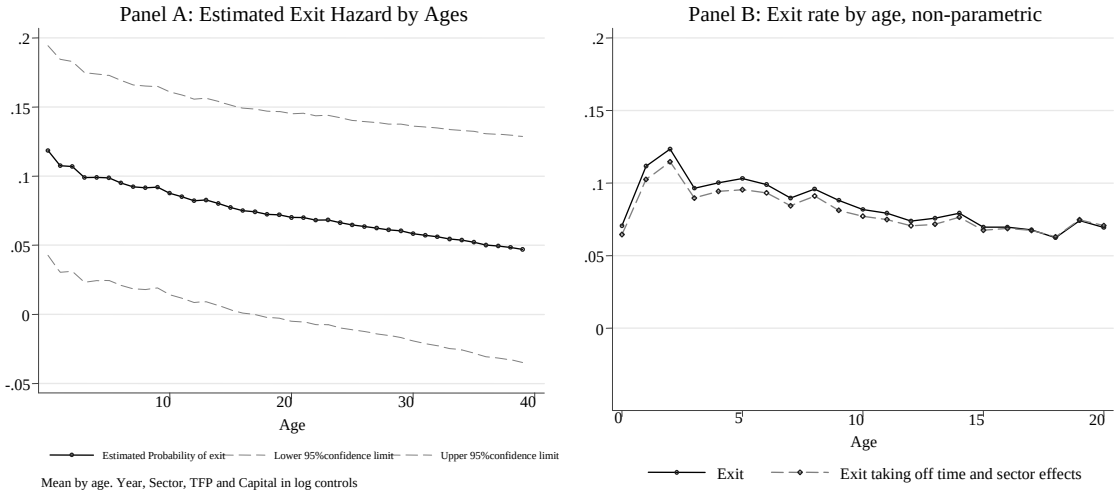


Table 1: Size and turnout by age

	Employment									
	Unweighted					*Employment weighted*				
Age Categorie	Mean	Sd	P10	P50	P90	Mean	Sd	P10	P50	P90
0 to 4	42.3	93.69	6	18	83	249.79	389.62	16	93	684
5 to 9	46.67	99.71	7	20	93	259.69	374.44	18	100	716
10 to 14	52.4	112.9	7	23	106	295.68	436.62	20	114	843
15+	99.3	207.68	8	33	239	533.65	680.86	41	292	1318
	Production in logs									
	Unweighted					*Employment weighted*				
Age Categorie	Mean	Sd	P10	P50	P90	Mean	Sd	P10	P50	P90
0 to 4	13.96	1.57	12.23	13.68	16.25	15.76	2	13.13	15.8	18.3
5 to 9	14	1.51	12.31	13.77	16.09	15.71	1.92	13.25	15.6	18.33
10 to 14	14.06	1.52	12.29	13.86	16.12	15.83	1.88	13.4	15.75	18.42
15+	14.64	1.86	12.44	14.36	17.34	17.03	1.91	14.36	17.23	19.4
	Exit rate									
	Unweighted					*Employment weighted*				
Age Categorie	Mean	Sd	P10	P50	P90	Mean	Sd	P10	P50	P90
0 to 4	0.10	0.30	0	0	1	0.058	0.233	0	0	0
5 to 9	0.09	0.29	0	0	0	0.053	0.224	0	0	0
10 to 14	0.08	0.27	0	0	0	0.037	0.189	0	0	0
15+	0.06	0.24	0	0	0	0.021	0.145	0	0	0

Table 2: Growth by age

Panel A: All the establishments

	Employment DHS growth									
	Unweighted					*Employment weighted*				
Age Categorie	Mean	sd	p10	p50	p90	Mean	sd	p10	p50	p90
0 to 4	0.62	1.20	-0.50	0.21	2.00	0.36	0.90	-0.32	0.09	2.00
5 to 9	0.10	0.98	-0.78	0.00	2.00	0.06	0.61	-0.34	0.02	0.46
10 to 14	-0.01	0.83	-0.67	0.00	0.58	0.01	0.50	-0.32	0.00	0.32
15+	-0.07	0.66	-0.48	0.00	0.28	-0.02	0.35	-0.26	0.00	0.22
	Production DHS growth									
	Unweighted					*Employment weighted*				
Age Categorie	Mean	Sd	P10	P50	P90	Mean	Sd	P10	P50	P90
0 to 4	0.68	1.22	-0.66	0.37	2.00	0.44	0.94	-0.34	0.18	2.00
5 to 9	0.13	1.02	-1.06	0.06	2.00	0.09	0.70	-0.44	0.06	0.60
10 to 14	0.02	0.88	-0.87	0.03	0.81	0.04	0.61	-0.42	0.05	0.48
15+	-0.05	0.71	-0.64	0.01	0.42	0.01	0.42	-0.32	0.03	0.32

Panel B: Continuing establishments only

	Employment DHS growth									
	Unweighted					*Employment weighted*				
Age Categorie	Mean	sd	p10	p50	p90	Mean	sd	p10	p50	p90
0 to 4	0.04	0.37	-0.33	0.00	0.43	0.06	0.36	-0.31	0.03	0.45
5 to 9	0.00	0.32	-0.35	0.00	0.33	0.02	0.30	-0.29	0.01	0.34
10 to 14	-0.02	0.30	-0.33	0.00	0.29	0.00	0.28	-0.29	0.00	0.29
15+	-0.02	0.27	-0.29	0.00	0.22	-0.01	0.24	-0.24	0.00	0.21
	Production DHS growth									
	Unweighted					*Employment weighted*				
Age Categorie	Mean	sd	p10	p50	p90	Mean	sd	p10	p50	p90
0 to 4	0.11	0.52	-0.43	0.08	0.69	0.16	0.50	-0.32	0.10	0.68
5 to 9	0.03	0.44	-0.44	0.04	0.47	0.04	0.44	-0.37	0.06	0.46
10 to 14	0.01	0.41	-0.43	0.03	0.42	0.04	0.44	-0.38	0.05	0.42
15+	0.00	0.37	-0.39	0.02	0.35	0.02	0.33	-0.29	0.03	0.31

Panel C: Continuing establishments and exiters only

	Employment DHS growth									
	Unweighted					*Employment weighted*				
Age Categorie	Mean	Sd	P10	P50	P90	Mean	Sd	P10	P50	P90
0 to 4	-0.18	0.72	-2.00	0.00	0.40	0.00	0.51	-0.41	0.02	0.43
5 to 9	-0.20	0.67	-1.57	0.00	0.31	-0.03	0.44	-0.36	0.01	0.33
10 to 14	-0.18	0.61	-0.75	0.00	0.26	-0.04	0.40	-0.33	0.00	0.29
15+	-0.15	0.55	-0.50	0.00	0.22	-0.03	0.32	-0.26	0.00	0.21
	Production DHS growth									
	Unweighted					*Employment weighted*				
Age Categorie	Mean	Sd	P10	P50	P90	Mean	Sd	P10	P50	P90
0 to 4	-0.12	0.82	-2.00	0.03	0.64	0.08	0.63	-0.42	0.09	0.67
5 to 9	-0.18	0.74	-2.00	0.00	0.44	-0.02	0.56	-0.46	0.05	0.45
10 to 14	-0.16	0.68	-1.05	0.00	0.40	-0.01	0.53	-0.43	0.05	0.41
15+	-0.13	0.61	-0.67	0.00	0.33	-0.01	0.39	-0.32	0.03	0.31

Table 3: Fraction of establishments and employment represented by different age-size categories

Establishments by establishment age and size

Establishment siz	0 to 4	5 to 9	10 to 14	15+	Total
Small	7,206.00	15,752.00	18,083.00	51,448.00	92,489.00
Medium	1,274.00	3,360.00	4,659.00	21,540.00	30,833.00
Large	279.00	674.00	964.00	9,495.00	11,412.00
Total	8,759.00	19,786.00	23,706.00	82,483.00	134,734.00

Employment by establishment age and size

Establishment siz	0 to 4	5 to 9	10 to 14	15+	Total
Small	120,719.00	271,860.00	322,603.00	956,214.00	1,671,396.00
Medium	111,848.00	289,809.00	415,276.00	2,105,656.00	2,922,589.00
Large	115,226.00	290,483.00	417,382.00	4,650,910.00	5,474,001.00
Total	347,793.00	852,152.00	1,155,261.00	7,712,780.00	10,067,986.00

Production (in billions of 2009 pesos) by establishment age and size

Establishment siz	0 to 4	5 to 9	10 to 14	15+	Total
Small	13.70	25.30	27.30	86.40	152.70
Medium	17.80	37.00	44.80	285.30	384.90
Large	14.80	37.60	54.60	856.20	963.30
Total	46.30	100.00	126.70	1,227.90	1,500.90

Table 4: Five-year transitions between establishment size categories, for establishments of different ages.

	All ages			*Establishments aged 0 to 4 in year t*			*Establishments aged 5 to 9 in year t*			*Establishments aged 10 to 14 in year t*			*Establishments aged 15 or more in year t*		
Panel A1: Number of establishments															
	S in t+4	*M in t+4*	*L in t+4*	*S in t+4*	*M in t+4*	*L in t+4*	*S in t+4*	*M in t+4*	*L in t+4*	*S in t+4*	*M in t+4*	*L in t+4*	*S in t+4*	*M in t+4*	*L in t+4*
Small in t	48,715	3,892	50	3,616	353	18	8,345	717		10,062	780	5	26,320	2,023	25
Medium in t	3,734	15,009	1,527	193	532	99	478	1,568	155	725	2,264	223	2,329	10,640	1,050
Large in t	87	1,261	6,530	7	31	166	3	62	440	12	131	520	65	1,034	5,401
Panel A2: Proportion of establishments out of those in the size category in t+4															
	S in t+4	*M in t+4*	*L in t+4*	*S in t+4*	*M in t+4*	*L in t+4*	*S in t+4*	*M in t+4*	*L in t+4*	*S in t+4*	*M in t+4*	*L in t+4*	*S in t+4*	*M in t+4*	*L in t+4*
Small in t	92.6%	19.3%	0.6%	94.8%	38.5%	6.4%	94.6%	30.5%		93.2%	24.6%	0.7%	91.7%	14.8%	0.4%
Medium in t	7.1%	74.4%	18.8%	5.1%	58.1%	35.0%	5.4%	66.8%		6.7%	71.3%	29.8%	8.1%	77.7%	16.2%
Large in t	0.2%	6.3%	80.5%	0.2%	3.4%	58.7%	0.0%	2.6%		0.1%	4.1%	69.5%	0.2%	7.5%	83.4%
Panel B: Number of jobs															
	S in t+4	*M in t+4*	*L in t+4*	*S in t+4*	*M in t+4*	*L in t+4*	*S in t+4*	*M in t+4*	*L in t+4*	*S in t+4*	*M in t+4*	*L in t+4*	*S in t+4*	*M in t+4*	*L in t+4*
Small in t	919,463	141,731	1,499	60,727	11,333	614	149,107	25,293		187,200	28,023	197	516,944	76,511	599
Medium in t	268,748	1,479,883	229,103	13,832	47,485	13,096	32,767	142,126	22,186	50,801	210,832	32,751	170,695	1,079,065	161,070
Large in t	26,848	353,261	3,470,398	2,384	7,945	80,453	1,055	17,611	209,545	4,843	36,089	245,174	18,566	290,919	2,934,084
Panel A2: Proportion of jobs out of those in the size category in t+4															
	S in t+4	*M in t+4*	*L in t+4*	*S in t+4*	*M in t+4*	*L in t+4*	*S in t+4*	*M in t+4*	*L in t+4*	*S in t+4*	*M in t+4*	*L in t+4*	*S in t+4*	*M in t+4*	*L in t+4*
Small in t	75.7%	7.2%	0.0%	78.9%	17.0%	0.7%	81.5%	13.7%		77.1%	10.2%	0.1%	73.2%	5.3%	0.0%
Medium in t	22.1%	74.9%	6.2%	18.0%	71.1%	13.9%	17.9%	76.8%		20.9%	76.7%	11.8%	24.2%	74.6%	5.2%
Large in t	2.2%	17.9%	93.8%	3.1%	11.9%	85.4%	0.6%	9.5%		2.0%	13.1%	88.2%	2.6%	20.1%	94.8%

Table 5: Cohort Analisis

Panel A: Total Employment

Cohort: Plant's inicial year of operation

Year	*before 1970*	*1970 to 1979*	*1980 to 1984*	*1985 to 1989*	*1990 to 1994*	*1995 to 1997*	*1998 to 2000*	*2001 to 2003*	*2004 to 2006*	*2007 to 2009*	*Total*
1994	316,612	139,428	80,396	73,248	26,377	-	-	-	-	-	636,061
1997	279,372	124,205	75,739	74,119	44,811	17,114	-	-	-	-	615,360
2000	222,464	102,478	63,371	64,540	43,868	20,669	8,297	-	-	-	525,687
2003	201,227	97,512	64,491	67,379	57,669	26,381	18,559	4,423	-	-	537,641
2006	215,886	106,163	69,771	78,947	68,357	37,073	25,226	12,544	3,182	-	617,149
2009	203,989	98,969	67,484	73,960	72,750	39,525	33,305	23,703	17,268	12,545	643,498
2009-1994	-112,623	-40,459	-12,912	712	46,373	39,525	33,305	23,703	17,268	12,545	7,437

Panel B: Number of establishment

Cohort: Plant's inicial year of operation

Year	*before 1970*	*1970 to 1979*	*1980 to 1984*	*1985 to 1989*	*1990 to 1994*	*1995 to 1997*	*1998 to 2000*	*2001 to 2003*	*2004 to 2006*	*2007 to 2009*	*Total*
1994	1,756	1,931	1,500	1,484	593	-	-	-	-	-	7,264
1997	1,643	1,891	1,511	1,585	1,032	375	-	-	-	-	8,037
2000	1,374	1,524	1,243	1,329	975	426	196	-	-	-	7,067
2003	1,212	1,375	1,104	1,271	1,051	521	388	138	-	-	7,060
2006	1,112	1,247	1,031	1,228	1,110	594	493	315	86	-	7,216
2009	1,029	1,114	968	1,235	1,286	740	794	693	596	373	8,828
2009-1994	-727	-817	-532	-249	693	740	794	693	596	373	1,564

Panel C: Mean of Employment

Cohort: Plant's inicial year of operation

Year	*before 1970*	*1970 to 1979*	*1980 to 1984*	*1985 to 1989*	*1990 to 1994*	*1995 to 1997*	*1998 to 2000*	*2001 to 2003*	*2004 to 2006*	*2007 to 2009*	*Total*
1994	180.3	72.2	53.6	49.4	44.5	-	-	-	-	-	87.6
1997	170.0	65.7	50.1	46.8	43.4	45.6	-	-	-	-	76.6
2000	161.9	67.2	51.0	48.6	45.0	48.5	42.3	-	-	-	74.4
2003	166.0	70.9	58.4	53.0	54.9	50.6	47.8	32.1	-	-	76.2
2006	194.1	85.1	67.7	64.3	61.6	62.4	51.2	39.8	37.0	-	85.5
2009	198.2	88.8	69.7	59.9	56.6	53.4	41.9	34.2	29.0	33.6	72.9
2009-1994	17.94	16.64	16.12	10.53	12.09	53.41	41.95	34.20	28.97	33.63	-14.67

Panel D: Total Production in billons of pesos

Cohort: Plant's inicial year of operation

Year	*before 1970*	*1970 to 1979*	*1980 to 1984*	*1985 to 1989*	*1990 to 1994*	*1995 to 1997*	*1998 to 2000*	*2001 to 2003*	*2004 to 2006*	*2007 to 2009*	*Total*
1994	43.8	12.4	5.9	5.1	2.6	-	-	-	-	-	69.9
1997	43.6	12.8	6.6	6.2	3.9	1.8	-	-	-	-	74.8
2000	40.1	12.0	6.7	6.2	4.8	3.2	1.6	-	-	-	74.5
2003	41.6	13.4	8.4	7.7	6.7	5.0	3.4	0.5	-	-	86.8
2006	51.3	17.4	11.6	10.0	8.8	6.4	4.0	1.7	0.5	-	111.7
2009	52.5	17.0	11.4	11.3	10.3	7.8	5.5	3.7	3.0	2.5	125.0
2009-1994	8.70	4.60	5.50	6.20	7.70	7.80	5.50	3.70	3.00	2.50	55.10

Table 6. Cohort Analysis by size

Panel A: Total Employment

Year	*before 1970*			*1970 to 1979*			*1980 to 1984*			*1985 to 1989*			*1990 to 1994*			*1995 to 1999*			*2000 to2004*			*2005-2009*		
	small	medium	large	small	medium	large	small	medium	large	small	medium	large	small	medium	large	small	medium	large	small	medium	large	small	me	dium	total
1994	19,898	60,419	236,295	28,931	52,239	58,258	24,212	34,200	21,984	24,750	26,695	21,803	9,752	8,869	7,756	0	0	0	0	0	0	0	0	636,061
1997	17,898	54,455	207,019	27,702	47,297	49,206	24,910	31,424	19,405	27,397	25,599	21,123	17,432	12,448	14,931	5,292	3,760	8,062	0	0	0	0	0	615,360
2000	13,953	42,610	165,901	20,814	38,658	43,006	20,189	26,244	16,938	22,554	23,884	18,102	17,304	12,474	14,090	10,586	8,780	8,796	390	414	0	0	0	525,687
2003	12,283	40,730	148,214	20,778	35,378	41,356	20,183	26,545	17,763	23,790	25,471	18,118	20,607	17,726	19,336	16,361	12,481	11,466	4,422	3,497	1,136	0	0	537,641
2006	13,435	45,188	157,263	21,477	38,403	46,283	22,550	28,863	18,358	28,894	32,129	17,924	25,499	21,600	21,258	24,573	16,985	13,499	10,900	8,862	1,658	675	672	617,149
2009	13,084	45,089	145,816	20,486	36,517	41,966	22,134	27,691	17,659	28,964	31,620	13,376	29,905	23,728	19,117	28,874	19,630	13,385	21,984	14,329	3,973	12,521	7,799	643,498
2009-1994	-6,814	-15,330	-90,479	-8,445	-15,722	-16,292	-2,078	-6,509	-4,325	4,214	4,925	-8,427	20,153	14,859	11,361	28,874	19,630	13,385	21,984	14,329	3,973	12,521	7,799	7,437

Panel B: Number of establishments

Year	*before 1970*			*1970 to 1979*			*1980 to 1984*			*1985 to 1989*			*1990 to 1994*			*1995 to 1999*			*2000 to2004*			*2005-2009*		
	small	medium	large	small	medium	large	small	medium	large	small	medium	large	small	medium	large	small	medium	large	small	medium	large	small	me	dium	total
1994	772	546	438	1,256	531	144	1,065	368	67	1,136	294	54	480	95	18	0	0	0	0	0	0	0	0	7,264
1997	714	520	409	1,253	510	128	1,111	342	58	1,244	289	52	867	136	29	318	44	13	0	0	0	0	0	8,037
2000	553	440	381	958	450	116	907	282	54	1,034	246	49	805	141	29	494	85	19	20	4	0	0	0	7,067
2003	462	393	357	855	408	112	801	251	52	974	253	44	845	170	36	660	128	24	197	35	3	0	0	7,060
2006	416	364	332	779	363	105	757	228	46	958	232	38	902	174	34	795	123	23	430	77	3	29	7	7,216
2009	374	344	311	682	328	104	719	209	40	969	234	32	1,063	188	35	1,059	164	25	1,019	151	11	672	84	8,828
2009-1994	-398	-202	-127	-574	-203	-40	-346	-159	-27	-167	-60	-22	583	93	17	1,059	164	25	1,019	151	11	672	84	1,564

Panel C: Mean of Employment

Year	*before 1970*			*1970 to 1979*			*1980 to 1984*			*1985 to 1989*			*1990 to 1994*			*1995 to 1999*			*2000 to2004*			*2005-2009*		
	small	medium	large	small	medium	large	small	medium	large	small	medium	large	small	medium	large	small	medium	large	small	medium	large	small	me	dium	total
1994	25.78	110.66	539.49	23.03	98.38	404.57	22.73	92.94	328.12	21.79	90.80	403.76	20.32	93.36	430.89									87.56
1997	25.07	104.72	506.16	22.11	92.74	384.42	22.42	91.88	334.57	22.02	88.58	406.21	20.11	91.53	514.86	16.64	85.46	620.15						76.57
2000	25.23	96.84	435.44	21.73	85.91	370.74	22.26	93.06	313.67	21.81	97.09	369.43	21.50	88.47	485.86	21.43	103.29	462.95	19.50	103.50				74.39
2003	26.59	103.64	415.17	24.30	86.71	369.25	25.20	105.76	341.60	24.43	100.68	411.77	24.39	104.27	537.11	24.79	97.51	477.75	22.45	99.91	378.67			76.15
2006	32.30	124.14	473.68	27.57	105.79	440.79	29.79	126.59	399.09	30.16	138.49	471.68	28.27	124.14	625.24	30.91	138.09	586.91	25.35	115.09	552.67	23.28	96.00	85.53
2009	34.98	131.07	468.86	30.04	111.33	403.52	30.78	132.49	441.48	29.89	135.13	418.00	28.13	126.21	546.20	27.27	119.70	535.40	21.57	94.89	361.18	18.63	92.85	72.89
2009-1994	9	20	-71	7	13	-1	8	40	113	8	44	14	8	33	115	27	120	535	22	95	361	19	93	-15

Panel D: Total Production in billons of 2009 pesos

Year	*before 1970*			*1970 to 1979*			*1980 to 1984*			*1985 to 1989*			*1990 to 1994*			*1995 to 1999*			*2000 to2004*			*2005-2009*		
	small	medium	large	small	medium	large	small	medium	large	small	medium	large	small	medium	large	small	medium	large	small	medium	large	small	me	dium	total
1994	1.60	7.80	34.50	1.70	4.30	6.40	1.40	2.40	2.20	1.50	1.90	1.70	0.70	1.20	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	69.90
1997	1.60	7.90	34.10	1.80	4.30	6.60	1.50	2.50	2.60	1.60	2.50	2.10	1.20	1.40	1.30	0.30	0.50	1.00	0.00	0.00	0.00	0.00	0.00	74.80
2000	1.60	7.00	31.50	1.80	4.30	6.00	1.30	2.30	3.10	1.60	2.70	1.90	1.50	1.80	1.50	1.50	1.60	1.40	0.00	0.20	0.00	0.00	0.00	74.50
2003	1.70	7.40	32.50	2.00	4.80	6.70	1.50	2.90	4.00	2.00	3.40	2.30	2.00	2.70	2.00	3.00	2.80	2.10	0.50	0.40	0.20	0.00	0.00	86.80
2006	2.20	8.70	40.40	2.50	5.80	9.10	2.10	3.50	5.90	2.60	4.20	3.10	2.70	3.30	2.70	3.40	3.50	2.60	1.40	1.00	0.30	0.10	0.20	111.70
2009	2.90	9.60	39.90	2.70	6.10	8.20	2.40	3.80	5.20	3.40	4.70	3.20	3.50	3.80	3.00	4.50	3.90	3.40	3.20	1.90	0.80	1.60	1.50	125.00
2009-1994	1.30	1.80	5.40	1.00	1.80	1.80	1.00	1.40	3.00	1.90	2.80	1.50	2.80	2.60	2.30	4.50	3.90	3.40	3.20	1.90	0.80	1.60	1.50	55.10

Table 7: Performance by age

	Investment rate									
	Unweighted					*Employment weighted*				
Age Categories	Mean	Sd	p10	p50	p90	Mean	Sd	p10	p50	p90
0 to 4	1.10	17.45	0.00	0.06	1.09	1.21	14.49	0.00	0.14	1.26
5 to 9	0.34	3.64	0.00	0.04	0.66	0.32	2.15	-0.01	0.09	0.72
10 to 14	0.35	11.17	-0.02	0.02	0.54	0.28	5.50	-0.04	0.08	0.60
15+	0.56	98.10	-0.05	0.02	0.46	0.27	38.13	-0.06	0.07	0.53
	TFP									
	Unweighted					*Employment weighted*				
Age Categories	Mean	Sd	p10	p50	p90	Mean	Sd	p10	p50	p90
0 to 4	2.64	0.75	1.86	2.59	3.47	2.68	0.75	1.91	2.66	3.50
5 to 9	2.55	0.65	1.86	2.53	3.28	2.60	0.66	1.94	2.62	3.27
10 to 14	2.53	0.63	1.87	2.52	3.23	2.63	0.63	2.00	2.63	3.27
15+	2.57	0.60	1.91	2.56	3.26	2.67	0.57	2.02	2.67	3.33
	Dummy=1 if the establishment exports									
	Unweighted					*Employment weighted*				
Age Categories	Mean	Sd	p10	p50	p90	Mean	Sd	p10	p50	p90
0 to 4	0.23	0.42	0.00	0.00	1.00	0.48	0.50	0.00	0.00	1.00
5 to 9	0.24	0.43	0.00	0.00	1.00	0.49	0.50	0.00	0.00	1.00
10 to 14	0.25	0.44	0.00	0.00	1.00	0.50	0.50	0.00	0.00	1.00
15+	0.35	0.48	0.00	0.00	1.00	0.68	0.47	0.00	1.00	1.00
	Exports share									
	Unweighted					*Employment weighted*				
Age Categories	Mean	Sd	p10	p50	p90	Mean	Sd	p10	p50	p90
0 to 4	0.23	0.39	0.00	0.00	1.00	0.27	0.40	0.00	0.01	1.00
5 to 9	0.20	0.37	0.00	0.00	1.00	0.27	0.39	0.00	0.02	1.00
10 to 14	0.18	0.36	0.00	0.00	1.00	0.28	0.40	0.00	0.02	1.00
15+	0.21	0.37	0.00	0.00	1.00	0.27	0.37	0.00	0.07	1.00

Table 8: TFP as a function of age

VARIABLES	(1) TFP	(2) TFP	(3) TFP
Age	-0.00423**	-0.00445**	-0.00384**
	[0.000357]	[0.000365]	[0.000373]
Age2	6.83e-05**	7.06e-05**	6.44e-05**
	[5.22e-06]	[5.36e-06]	[5.46e-06]
Exit*Age			-0.00775**
			[0.00167]
Exit		-0.286**	-0.180**
		[0.00776]	[0.0199]
Exit*Age2			7.32e-05**
			[2.74e-05]
Constant	2.763**	2.805**	2.795**
	[0.00899]	[0.00909]	[0.00919]
Observations	117,430	109,172	109,172
R-squared	0.095	0.112	0.112
Year effects	YES	YES	YES
Sector effects	YES	YES	YES

Robust standard errors in brackets

** p<0.01, * p<0.05, + p<0.1

Table 9: Growth by age , continuing establishments

1993-1997

Employment DHS growth

	Unweighted						*Employment weighted*				
Age Categorie	N	Mean	sd	p10	p50	p90	Mean	sd	p10	p50	p90
0 to 4	64	0.10	0.28	-0.13	0.07	0.47	0.12	0.29	-0.12	0.03	0.51
5 to 9	176	0.04	0.28	-0.23	0.01	0.37	0.06	0.28	-0.18	0.01	0.43
10 to 14	232	-0.01	0.31	-0.33	0.01	0.27	0.00	0.30	-0.29	0.00	0.27
15+	2,260	-0.01	0.26	-0.26	0.00	0.23	-0.01	0.26	-0.24	0.00	0.23

Production DHS growth

	Unweighted						*Employment weighted*				
Age Categorie	N	Mean	sd	p10	p50	p90	Mean	sd	p10	p50	p90
0 to 4	58	0.22	0.49	-0.21	0.12	0.69	0.24	0.49	-0.18	0.09	0.91
5 to 9	157	0.03	0.56	-0.36	0.05	0.46	0.00	0.60	-0.31	0.03	0.46
10 to 14	208	0.04	0.44	-0.36	0.05	0.47	0.03	0.51	-0.41	0.05	0.53
15+	2,218	0.02	0.32	-0.27	0.02	0.30	0.02	0.31	-0.25	0.02	0.28

2003-2007

Employment DHS growth

	Unweighted						*Employment weighted*				
Age	N	Mean	Sd	P10	P50	P90	N	Mean	Sd	P10	P50	P90
0 to 4	22	0.19	0.44	-0.26	0.13	0.53	9,235	0.19	0.41	-0.26	0.10	0.53
5 to 9	179	0.08	0.29	-0.21	0.06	0.40	73,551	0.08	0.28	-0.22	0.06	0.41
10 to 14	241	0.06	0.22	-0.12	0.04	0.30	129,946	0.05	0.24	-0.16	0.04	0.30
15+	2,746	0.04	0.20	-0.13	0.03	0.24	1,357,392	0.04	0.19	-0.13	0.03	0.24

Production DHS growth

	Unweighted						*Employment weighted*				
0 to 4	22	0.26	0.41	-0.02	0.15	0.90	9,235	0.23	0.38	-0.13	0.15	0.65
5 to 9	178	0.11	0.36	-0.17	0.08	0.43	73,191	0.11	0.35	-0.17	0.08	0.52
10 to 14	235	0.14	0.41	-0.14	0.11	0.41	125,068	0.16	0.48	-0.21	0.11	0.45
15+	2,730	0.08	0.29	-0.15	0.08	0.31	1,349,821	0.09	0.30	-0.14	0.08	0.31

Table A1.A: Size and turnout by age (small establisments)

Employment

	Unweighted					*Employment weighted*				
Age Categorie	Mean	Sd	P10	P50	P90	Mean	Sd	P10	P50	P90
0 to 4	17.98	11.39	6	15	36	25.20	12.33	10	24	44
5 to 9	18.89	11.62	6	16	37	26.04	12.34	10	25	44
10 to 14	19.45	11.95	6	16	38	26.78	12.53	11	26	45
15+	20.19	12.36	7	17	40	27.76	12.72	11	27	46

Production in logs

	Unweighted					*Employment weighted*				
Age Categorie	Mean	Sd	P10	P50	P90	Mean	Sd	P10	P50	P90
0 to 4	13.53	1.21	12.14	13.38	15.08	13.92	1.25	12.44	13.81	15.61
5 to 9	13.53	1.13	12.21	13.44	14.96	13.90	1.14	12.53	13.83	15.32
10 to 14	13.51	1.12	12.16	13.43	14.88	13.90	1.12	12.54	13.88	15.24
15+	13.55	1.15	12.18	13.47	15.00	13.98	1.13	12.59	13.95	15.34

Exit rate

	Unweighted					*Employment weighted*				
Age Categorie	Mean	Sd	P10	P50	P90	Mean	Sd	P10	P50	P90
0 to 4	0.12	0.32	0	0	1	0.10	0.30	0	0	0
5 to 9	0.11	0.31	0	0	1	0.09	0.28	0	0	0
10 to 14	0.09	0.29	0	0	0	0.07	0.25	0	0	0
15+	0.09	0.28	0	0	0	0.06	0.24	0	0	0

Table A1.B: Size and turnout by age (medium establisments)

Employment

	Unweighted					*Employment weighted*				
Age Categorie	Mean	Sd	P10	P50	P90	Mean	Sd	P10	P50	P90
0 to 4	90.49	37.22	54	78.5	154	105.79	42.31	57	95	172
5 to 9	90.31	35.99	54	79	147	104.65	40.86	58	96	169
10 to 14	91.96	37.29	55	80	153	107.08	41.97	58	98	172
15+	100.53	40.52	56	89	166	116.86	43.21	61	113	180

Production in logs

	Unweighted					*Employment weighted*				
Age Categorie	Mean	Sd	P10	P50	P90	Mean	Sd	P10	P50	P90
0 to 4	15.66	1.36	14.08	15.58	17.40	15.87	1.37	14.28	15.84	17.67
5 to 9	15.51	1.23	14.10	15.40	17.13	15.68	1.25	14.23	15.58	17.33
10 to 14	15.49	1.09	14.24	15.42	16.91	15.68	1.11	14.37	15.62	17.09
15+	15.74	1.13	14.44	15.62	17.28	15.95	1.14	14.61	15.85	17.50

Table A1.B: Size and turnout by age (medium establisments)

	Exit rate									
	Unweighted					*Employment weighted*				
Age Categorie	Mean	Sd	P10	P50	P90	Mean	Sd	P10	P50	P90
0 to 4	0.04	0.20	0	0	0	0.04	0.19	0	0	0
5 to 9	0.05	0.23	0	0	0	0.05	0.22	0	0	0
10 to 14	0.04	0.19	0	0	0	0.03	0.18	0	0	0
15+	0.03	0.17	0	0	0	0.03	0.16	0	0	0

Table A1.C: Size and turnout by age (large establisments)

	Employment									
	Unweighted					*Employment weighted*				
Age Categorie	Mean	Sd	P10	P50	P90	Mean	Sd	P10	P50	P90
0 to 4	423.63	292.52	214	328.5	749	624.87	492.60	233	458	1116
5 to 9	440.79	291.33	219	342	774	633.05	441.62	237	491	1290
10 to 14	442.14	331.99	216	315	840	691.16	527.35	233	498	1414
15+	496.15	404.79	221	354	947	826.36	742.25	251	584	1664
	Production in logs									
	Unweighted					*Employment weighted*				
Age Categorie	Mean	Sd	P10	P50	P90	Mean	Sd	P10	P50	P90
0 to 4	17.34	1.14	15.90	17.49	18.70	17.68	1.16	16.21	17.83	19.17
5 to 9	17.34	1.24	15.83	17.53	18.75	17.56	1.26	15.94	17.81	18.81
10 to 14	17.23	1.30	15.63	17.31	18.80	17.56	1.29	15.97	17.71	18.96
15+	17.67	1.19	16.19	17.65	19.23	18.14	1.24	16.52	18.20	19.72
	Exit rate									
	Unweighted					*Employment weighted*				
Age Categorie	Mean	Sd	P10	P50	P90	Mean	Sd	P10	P50	P90
0 to 4	0.04	0.20	0	0	0	0.04	0.19	0	0	0
5 to 9	0.03	0.16	0	0	0	0.03	0.16	0	0	0
10 to 14	0.02	0.13	0	0	0	0.02	0.13	0	0	0
15+	0.01	0.12	0	0	0	0.01	0.10	0	0	0

Table A2.B: Growth by age (medium establisments)

Panel A: All the establishments

	Employment DHS growth									
	Unweighted					*Employment weighted*				
Age Categorie	Mean	sd	p10	p50	p90	Mean	sd	p10	p50	p90
0 to 4	0.31	0.81	-0.31	0.08	2.00	0.31	0.81	-0.31	0.07	2.00
5 to 9	0.05	0.52	-0.30	0.03	0.39	0.05	0.51	-0.31	0.03	0.37
10 to 14	0.02	0.45	-0.30	0.02	0.31	0.02	0.43	-0.29	0.02	0.31
15+	-0.02	0.38	-0.28	0.00	0.24	-0.02	0.36	-0.27	0.00	0.24
	Production DHS growth									
	Unweighted					*Employment weighted*				
Age Categorie	Mean	sd	p10	p50	p90	Mean	sd	p10	p50	p90
0 to 4	0.41	0.88	-0.35	0.19	2.00	0.41	0.88	-0.32	0.19	2.00
5 to 9	0.07	0.62	-0.44	0.07	0.53	0.06	0.61	-0.42	0.06	0.50
10 to 14	0.06	0.54	-0.38	0.06	0.46	0.05	0.53	-0.38	0.06	0.45
15+	0.00	0.46	-0.37	0.03	0.35	0.00	0.44	-0.36	0.03	0.34

Panel B: Continuing establishment only

	Employment DHS growth									
	Unweighted					*Employment weighted*				
Age Categorie	Mean	sd	p10	p50	p90	Mean	sd	p10	p50	p90
0 to 4	0.06	0.38	-0.32	0.04	0.45	0.07	0.37	-0.32	0.04	0.44
5 to 9	0.03	0.30	-0.27	0.02	0.34	0.02	0.30	-0.28	0.03	0.34
10 to 14	0.01	0.28	-0.27	0.02	0.28	0.01	0.28	-0.27	0.02	0.29
15+	-0.01	0.25	-0.26	0.00	0.23	-0.01	0.25	-0.25	0.00	0.23
	Production DHS growth									
	Unweighted					*Employment weighted*				
Age Categorie	Mean	sd	p10	p50	p90	Mean	sd	p10	p50	p90
0 to 4	0.16	0.56	-0.36	0.12	0.75	0.17	0.55	-0.32	0.12	0.74
5 to 9	0.04	0.45	-0.38	0.06	0.44	0.04	0.44	-0.37	0.06	0.43
10 to 14	0.04	0.41	-0.35	0.06	0.41	0.04	0.41	-0.34	0.05	0.41
15+	0.01	0.36	-0.34	0.03	0.34	0.01	0.35	-0.33	0.03	0.33

Panel C: Continuing establishment and exiters only

	Employment DHS growth									
	Unweighted					*Employment weighted*				
Age Categorie	Mean	sd	p10	p50	p90	Mean	sd	p10	p50	p90
0 to 4	0.03	0.45	-0.37	0.03	0.44	0.03	0.46	-0.36	0.04	0.44
5 to 9	-0.01	0.40	-0.31	0.02	0.33	-0.01	0.40	-0.31	0.02	0.33
10 to 14	-0.02	0.35	-0.30	0.01	0.28	-0.01	0.35	-0.30	0.02	0.29
15+	-0.04	0.34	-0.28	0.00	0.23	-0.03	0.33	-0.28	0.00	0.23
	Production DHS growth									
	Unweighted					*Employment weighted*				
Age Categorie	Mean	sd	p10	p50	p90	Mean	sd	p10	p50	p90
0 to 4	0.13	0.62	-0.41	0.11	0.75	0.13	0.62	-0.37	0.11	0.74
5 to 9	0.01	0.52	-0.45	0.06	0.44	0.01	0.51	-0.44	0.06	0.42
10 to 14	0.02	0.47	-0.39	0.05	0.41	0.02	0.46	-0.38	0.05	0.40
15+	-0.01	0.43	-0.37	0.03	0.34	-0.01	0.41	-0.36	0.03	0.33

Table A2.C: Growth by age (large establisments)

Panel A: All the establishments

	Employment DHS growth									
	Unweighted					*Employment weighted*				
Age Categorie	Mean	sd	p10	p50	p90	Mean	sd	p10	p50	p90
0 to 4	0.25	0.68	-0.24	0.08	1.57	0.19	0.62	-0.26	0.06	0.79
5 to 9	0.06	0.40	-0.22	0.02	0.38	0.06	0.38	-0.22	0.03	0.38
10 to 14	0.00	0.35	-0.28	0.01	0.28	0.01	0.35	-0.27	0.01	0.30
15+	-0.01	0.27	-0.23	0.00	0.21	-0.01	0.26	-0.22	0.00	0.20
	Production DHS growth									
	Unweighted					*Employment weighted*				
Age Categorie	Mean	sd	p10	p50	p90	Mean	sd	p10	p50	p90
0 to 4	0.34	0.72	-0.21	0.16	2.00	0.29	0.66	-0.24	0.13	1.12
5 to 9	0.09	0.53	-0.28	0.07	0.47	0.08	0.53	-0.29	0.06	0.50
10 to 14	0.03	0.47	-0.33	0.06	0.37	0.04	0.53	-0.36	0.07	0.44
15+	0.02	0.35	-0.27	0.03	0.29	0.02	0.34	-0.26	0.03	0.29

Panel B: Continuing establishments only

	Employment DHS growth									
	Unweighted					*Employment weighted*				
Age Categorie	Mean	sd	p10	p50	p90	Mean	sd	p10	p50	p90
0 to 4	0.11	0.36	-0.24	0.06	0.47	0.08	0.36	-0.26	0.04	0.47
5 to 9	0.04	0.27	-0.22	0.02	0.34	0.04	0.27	-0.22	0.03	0.34
10 to 14	0.01	0.28	-0.26	0.01	0.28	0.01	0.28	-0.26	0.01	0.29
15+	0.00	0.23	-0.22	0.00	0.21	0.00	0.23	-0.22	0.00	0.20
	Production DHS growth									
	Unweighted					*Employment weighted*				
Age Categorie	Mean	sd	p10	p50	p90	Mean	sd	p10	p50	p90
0 to 4	0.20	0.45	-0.20	0.13	0.62	0.18	0.44	-0.24	0.11	0.59
5 to 9	0.07	0.43	-0.28	0.07	0.43	0.06	0.45	-0.28	0.06	0.46
10 to 14	0.04	0.42	-0.32	0.06	0.36	0.05	0.48	-0.34	0.07	0.42
15+	0.02	0.32	-0.27	0.03	0.29	0.02	0.31	-0.26	0.03	0.29

Panel C: Continuing establishments and exiters only

	Employment DHS growth									
	Unweighted					*Employment weighted*				
Age Categorie	Mean	sd	p10	p50	p90	Mean	sd	p10	p50	p90
0 to 4	0.08	0.43	-0.26	0.06	0.47	0.06	0.40	-0.30	0.04	0.46
5 to 9	0.03	0.31	-0.23	0.02	0.34	0.03	0.30	-0.22	0.03	0.34
10 to 14	0.00	0.33	-0.28	0.01	0.28	0.00	0.32	-0.27	0.01	0.29
15+	-0.01	0.26	-0.23	0.00	0.21	-0.01	0.25	-0.22	0.00	0.20
	Production DHS growth									
	Unweighted					*Employment weighted*				
Age Categorie	Mean	sd	p10	p50	p90	Mean	sd	p10	p50	p90
0 to 4	0.17	0.51	-0.21	0.13	0.60	0.16	0.48	-0.24	0.10	0.57
5 to 9	0.05	0.46	-0.28	0.07	0.43	0.05	0.47	-0.29	0.06	0.46
10 to 14	0.03	0.45	-0.33	0.06	0.36	0.03	0.51	-0.36	0.07	0.42
15+	0.02	0.35	-0.27	0.03	0.29	0.02	0.33	-0.26	0.03	0.29