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Small and Medium Firms, Aggregate Productivity and the Role of Dependencies*

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Abstract

We analyze the productivity contribution of firms in the Finnish business sector, using data from 2002 until 2014, and assess the role of the dependency status (i.e. whether they are owned, at least partially, by a mother company) of small and medium enterprises in the manufacturing and services industries, together with the whole private business sector. We find that dependent firms have provided a larger contribution to aggregate productivity growth, compared to the independent ones, regardless of the industry, size class and age groups considered. This result is mainly driven by the better reallocation of labour among dependent companies and by the positive productivity contribution of dependent entrants. Inside the dependent category, the foreign controlled firms contribute more to the aggregate productivity than the other dependent companies due to even more efficient reallocation of labour inputs. Moreover, we find that dependent firms tend to reach their peak productivity earlier than their independent counterparts. Finally, we examine the subgroup of high growing enterprises and find that the positive effect of dependencies on the productivity contribution holds also for this class of firms.

JEL Classifcation Code: O12, O14, O47

Keywords: productivity; decomposition; dependencies; small and medium firms

1 Introduction

Aggregate productivity and the mechanisms behind its evolution have been the focus of a large number of theoretical and empirical studies. These analyses have ranged from discerning the underlying causes of differences in productivity among firms (see Syverson, 2011, for a survey on this literature), to considering how aggregate productivity is determined by micro-level dynamics (see, for example, Foster, Haltiwanger, and

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Krizan, 2001). A recent example for the Finnish economy can be found in Hyytinen and Maliranta (2013). In this work, the authors look at different aspects of the decomposition of aggregate productivity, with a particular emphasis on entrants and how their adjustments, after entering the market, affect industry productivity growth through market selection.

A large share of the literature about the micro origins of employment and productivity growth has focused on a subgroup of enterprises, namely the small and medium (SME) ones. These firms, and in particular their contribution to job creation, has been documented since the seminal work of Birch (1981). More specifically, Birch found that a disproportionate share of net job growth was created by small enterprises. Later works, such as Davis, Haltiwanger, and Schuh (1996) and Neumark, Wall, and Zhang (2011), have criticized Birch's findings and have contested the role of small companies in net job creation. However, the recent consensus is that small companies are an essential element of employment generation (see Henrekson and Johansson, 2010, for a recent survey on the literature). Two examples for the Finnish economy are Hohti (2000) and Deschryvere (2008). An additional enterprise feature typically studied in relation to job creation and firm growth is the age. Haltiwanger, Jarmin, and Miranda (2013) find that young firms have been the main driver of job creation, highlighting the crucial role of start-ups in the economy. Moreover, they point out that, once controlled for age, firm size does not have a significant impact on job creation. Small businesses have also been widely examined with respect to their contribution to aggregate productivity: for an extensive survey on the topic we direct the reader to van Praag and Versloot (2007).

Another category of enterprises that has been heavily studied is the one of high growth firms (HGF). While HGFs have been mostly examined in regards to their contribution to job creation, there have been a number of studies looking at their productivity, such as Acs, Parsons, and Tracy (2008) and Du and Temouri (2015). In both studies, the authors find a positive correlation between being a HGF and larger productivity growth. In particular, Du and Temouri (2015) point out that highly productive companies have a higher chance to become HGFs. Another example is Mason, Robinson, and Rosazza-Bondibene (2012), who examine UK firms and show that HGFs have experienced large productivity growth but their contribution to the aggregate figures has been limited. Finally, Haltiwanger, Jarmin, Kulick, and Miranda (2016) find that young firms are more likely to belong to the HGF class and notice a

mild positive relationship between being a high output growth firm and size, once age is controlled for.

One of the aspects that has been largely disregarded in the analysis of SMEs and HGFs is the dependency status of the firm, i.e. if it is actually owned (at least partially) by another company. One could argue that the employment and production decisions of a dependent, small enterprise, can be influenced by its, possibly large, mother company. In this regard, one should try to disentangle the contribution to employment and productivity growth by independent and dependent small companies. Airaksinen, Luomaranta, Alajääskö, and Roodhuijzen (2015) have shown that dependent enterprises represent a substantial share of the employment of small firms, for multiple European countries, making them an interesting category to examine in terms of economic meaningfulness. There have been a small number of studies addressing this issue in relation to job creation, such as Boccara (1997) and Schreyer (2000). Recently, Fornaro and Luomaranta (2016) found that independent firms are the main driver for Finnish employment generation.

The contribution of dependent and independent small companies can shed additional light onto the mechanisms driving aggregate productivity dynamics. One can argue, as in Schreyer (2000), that dependent small companies have a better chance of productivity growth due to the access to the know-how of their mother company and to possibly better credit-market opportunities. On the other hand, independent companies might be more prone to grow and diversify their business, while subsidiaries might focus on a individual task and hence have a fairly stable productivity. An important paper that discusses this issue is Atalay, Hortaçsu, and Syverson (2014). In their study, the authors find that plants belonging to a vertical ownership structure are more productive than other plants in the same industry. However, they show that this productivity difference can be explained by the size of the firm to which the plant belongs to. Interestingly, they find that there is not an especially intensive transfer of goods between plants belonging to a vertical structure, but they find evidence of transfer of intangible inputs within the firm.

In this paper, we examine the contribution to Finnish aggregate productivity of micro, small and medium enterprises with a particular focus on the comparison between dependent and independent companies. Moreover, we study the high-growth firms subcategory, how they contribute to aggregate productivity during the process of growth

and in the subsequent years. Finally, we look at the productivity dynamics of SMEs while controlling for their age. It is important to point out that we are considering ownership links among firms and not plants (as in, e.g., Atalay et al., 2014). In this way, we allow for a possibly milder influence of the mother company on the subsidiaries, together with a more flexible range of ownership structures.

We find that dependent companies have a larger contribution to productivity growth in absolute terms, at least when we include medium firms in the analysis. Most of the contribution is due to the labour reallocation toward more productive enterprises (the between component) and not because of the within firm growth. In normalized terms, i.e. when considering the typical firm of a given group and take into account the group input share, we find that dependent firms have consistently higher productivity growth contributions, regardless of the size class examined or the sector of interest. We also divide the dependent SMEs into foreign controlled and other dependent firms (that are dependent of domestic large companies), to see whether foreign ownership has an effect on top of the dependency effect. We find, that the foreign owned SMEs are contributing positively to the productivity of the entire dependent SME category, mostly due to better reallocation of jobs toward more productive firms and the higher productivity of foreign owned entrants. Moreover, we see that the positive effect of dependencies on productivity are evident also when examining HGFs, with dependent firms having larger (albeit negative) productivity growth compared to independent companies. Finally, we find that controlling for age does not annul the effect dependencies. However, the positive impact of being a dependent firm becomes smaller for older enterprises.

The remainder of the paper is structured as follows: In Section 2 we describe the main methodology underlying the calculation of productivity contribution and lay down the main definitions needed for the analysis, in Section 3 we describe our firm-level dataset. In Section 4 we report the results of the analysis and Section 5 concludes.

2 Methodological issues

In this section we delineate the main measures and definitions used in the analysis, with a particular focus on the decomposition techniques adopted to compute the contribution of firms to aggregate productivity.

2.1 Size and productivity measures

The literature on SMEs has proposed multiple criteria to define an enterprise as such. Originally, as in Birch (1981), a firm size class was determined by the number of employees in the base year on which the growth rates are computed. As pointed out in Davis et al. (1996), this classification methodology leads to an overestimation of the job creation of small enterprises due to the regression to the mean bias, hence it is undesirable. In this study, we use what the literature has defined as dynamic classification method, i.e. we compute the average number of employees between the base year and the final year of the growth computation. The number of employees is measured in full time equivalents (FTE), which is the standard definition used in the Finnish national statistical office. FTEs are convenient because they treat coherently full time and part time workers, giving a realistic picture of how they contribute to production.

We also need to determine which enterprises should be included in the HGF class. Throughout the years, the literature has developed a series of guidelines which differ in the variable used (e.g. sales or number of employees) and growth thresholds (how much a company should grow on a certain time-span to be considered high growing). We follow the definition set in Ahmad (2006) and adopted in, e.g., Deschryvere (2008), by considering HGFs those enterprises that have experienced an average annualized growth of the number of employees by at least 20% per annum, over a three year period. We examine different size classes of enterprises experiencing these growth rates. Specifically, we study micro (1-9.5 FTEs), small (1-49.50 FTEs) and SMEs (1-249.5 FTEs) separately.

Productivity is measured in terms of labour productivity. Firms' output and input measures are described in detail in the next section. Following Hyytinen and Maliranta (2013), the index of industry-level productivity is defined as:

$$\Phi_t = \sum_{i \in I} w_{it} \phi_{it} \tag{1}$$

where ϕ_{it} is the index of labour productivity of firm i at time t and w_{it} is the input share of firm i in industry I. Productivity growth, between periods t and s, is computed using percentage changes, i.e.

$$\Delta\Phi_t = \frac{(\Phi_t - \Phi_s)}{0.5(\Phi_t + \Phi_s)}. \tag{2}$$

2.2 Productivity decomposition

To compute the productivity growth decomposition, we use the methodology initially proposed in Maliranta (2003) and recently adopted in Böckerman and Maliranta (2012) and Kauhanen and Maliranta (2012). It is addressed as modified Vainiomäki-Diewert-Fox decomposition and it is based on the works of Vainiomäki (1999) and Diewert and Fox (2009). This decomposition, at the industry level, is given by:

$$\Delta\Phi_t = WH_t + BW_t + EN_t + EX_t + Crossterms_t. \tag{3}$$

It is useful to describe the components of (3) in detail. Each industry has continuing, entering and exiting firms, which belong to subgroups $X \in \{C, E, D\}$ respectively. The input share for firm i at time t is defined as

$$w_{it} = \frac{L_{it}}{\sum_{i \in X} L_{it}}$$

and the input share of entering and exiting firms is defined, for $X \in \{E, D\}$ as

$$S_t^X = \frac{\sum_{i \in X} L_{it}}{\sum_{i \in X \cup C} L_{it}}.$$

Let's define $\overline{w}_{it} = \frac{1}{2}(w_{it}^C + w_{is}^C)$, $\Delta w_{it}^C = \frac{(w_{it}^C - w_{is}^C)}{\overline{w}_{it}^C}$, $\overline{\phi}_{it} = \frac{1}{2}(\phi_{it} + \phi_{is})$ and $\Delta\phi_{it} = \frac{(\phi_{it} - \phi_{is})}{\overline{\phi}_{it}}$. The terms in (3) are then:

$$WH_t = \sum_{i \in C} \overline{w}_{it}^C \Delta\phi_{it} \tag{4}$$

$$BW_t = \sum_{i \in C} \Delta w_{it}^C [\overline{\phi}_{it} - \overline{\Phi}_t^C] \tag{5}$$

$$EN_t = S_t^E [\Phi_t^E - \Phi_t^C] \tag{6}$$

$$EX_t = S_{t-1}^D [\Phi_s^C - \Phi_s^D] \tag{7}$$

Let us spend some time to give an interpretation to formulas (4)-(7). (4) is the within component of industry productivity growth, i.e. the weighted average of the productivity growth of continuing firms from time s to t, treating t and s symmetrically. (5) is the between component and describes how the reallocation of inputs among stayers

affects the productivity of a given industry. It can be positive if firms with increasing input share ($\Delta w_{it} > 0$) are more productive than the weighted average of incumbents ($\bar{\phi}_{it} > \overline{\Phi}_t^C$), or if firms with declining input share are less productive than the industry weighted average. The entry component (6) describes the contribution to industry productivity due to entrants. It is positive if the weighted average productivity of entrants is higher than that of continuing firms in t, where its magnitude is determined by the input share of entrant firms in relation to the number of employees in continuing enterprises. Finally, (7) defines the exit component, which indicates how industry productivity growth is affected by firms leaving the market. It is positive if the average productivity of exiting firms is lower than the one of continuing businesses.

Finally we need to describe the cross terms, which are a set of correction components used to make the terms in (3) add up to the standard aggregate measure of productivity growth rate. They are given by:

$$
\begin{aligned}
WHC_t &= \sum_{i \in C} \overline{w}_{it}^C \frac{(\phi_{it} - \phi_{is})}{\bar{\phi}_{it}} \left(\frac{\bar{\phi}_{it}}{\overline{\Phi}_t} - 1 \right) \\
BWC_t &= \sum_{i \in C} (w_{it}^C - w_{is}^C) \frac{\bar{\phi}_{it}}{\overline{\Phi}_t^C} \left(\frac{\overline{\Phi}_t^C}{\overline{\Phi}_t} - 1 \right) \\
ENC &= \sum_{i \in E} w_{it} \frac{(\phi_{it} - \Phi_t^C)}{\Phi_t^C} \left(\frac{\Phi_t^C}{\overline{\Phi}_t} - 1 \right) \\
EXC &= \sum_{i \in D} \frac{(\Phi_s^C - \phi_{is})}{\Phi_s^C} \left(\frac{\Phi_s^C}{\overline{\Phi}_t} - 1 \right)
\end{aligned}
$$

The WHC component has an interesting interpretation. If the enterprises with lower productivity levels at time s tend to experience larger productivity growth rates (what it is sometimes addressed in the literature as β-convergence), then WHC will be negative. This is because if the firms in the data experience a regression to the mean bias (β-convergence), then the within component will have an overrated contribution to aggregate productivity growth and WHC corrects this.

3 Data description

The data is treated and analyzed anonymously at the premises of Statistics Finland, the national statistics agency. The database covers all active enterprises in the non-financial business economy (NACE Rev.2 sections B to N, excl. K) for the period 2002 to 2014. The data is used to compile the official Structural business and financial statement

statistics (SBS). A unique identifier allows us to track each enterprise over time in the panel. We use gross value added (GVA) and employees as full time equivalents (FTE) to compute labour productivity. We define the age of the enterprise as represented by the administrative age of the legal unit in the register. The GVA measures the nominal added value produced by each enterprise annually. It is calculated by deducting the costs of operating activities from the income from the activities. Costs exclude the costs related to personnel. Employees are converted to full time equivalents so that, for example, an employee working half-time represents one half of a person and two employees working half-time for one year represent one annual full-time employee. We rely on the administrative age that is available to us, which is calculated from the first registration of the legal unit to the tax administration's databases and assume that it correctly represents the true age of an enterprise. This is not an entirely flawless procedure, as a firm can operate under many legal identifiers during its lifetime. For instance, legal restructuring and periods of passivity can be associated with changes in identifiers. However, the identifiers are not changed due to any action taken by the tax administration or due to Statistics Finland procedures, and they are generally very stable. Thus, we believe to have an accurate enough estimate of the true age of the firm, even if in some cases it leads to an underestimation of the true age.

The Finnish Business register contains information on ownership links between the enterprises that belong to a group that is resident in Finland, and the country of origin of the ultimate controlling unit is linkable from the IFATS statistics. By linking these data sources at micro-level to form panels of firms, we are able to pinpoint whether at any given time an enterprise is "independent" (no enterprise group links), "dependent" (the enterprise is at least partly owned by a mother, or the enterprise is a mother). Notice, that enterprises can stop being dependent without it affecting the unique identifier or age. The Finnish SBS population covers, in 2014, 275,572 enterprises with a total of 1.3 million employees (in full-time equivalents), however we apply some restrictions to our data by eliminating all the firms with less than one employee and industries that have data quality issues, i.e. agriculture and forestry, mining, energy sources, utilities, construction, financial intermediation and real estate. Moreover, we use the procedure suggested in Hyytinen and Maliranta (2013) to remove outliers. In the first step, we follow Mairesse and Kremp (1993) and remove observations whose log productivity level is more than 4.4 standard deviations from the weighted average. We then estimate

the decomposition (3) and see if the contribution of an individual firm to one of the component is larger than 2 percentage points in absolute terms. Those observations are then removed. The final sample is characterized in the following section.

4 Empirical Results

In this section we collect the results of our empirical analysis. We start by looking at the industry level data, to give a general overview of the Finnish economy and describe the main components underlying aggregate productivity growth. In subsection 4.2, we present the core of our analysis, i.e. we look at the effect of dependencies on the productivity contribution of firms in the manufacturing and service sectors, together with the overall population of private businesses. We then proceed to examine the high-growth firms and how being subsidiaries affects their labour productivity. Finally, we examine how controlling for age impacts our results on the effects of dependencies.

4.1 Productivity growth decomposition

We start by presenting some demographic characteristics of the firm data we have, i.e. we report the average number of firms, workers, workers in staying firms and share of workers in exiting and entering enterprises, at the industry level.

	N. Firms	FTEs	Stayers	FTEs stay	FTEs ent.(%)	FTEs ex.(%)
Business Sector	60,000	1,027,553	44,866	920,736	8.62	11.03
Manufacturing						
Food & Tobacco	771	30,308	634	27,079	10	11.62
Textile	430	7,838	338	6,925	7.63	14.51
Wood and paper	1,364	48,009	1,105	44,446	6.92	8.05
Chemical & Rubber	821	43,851	700	40,042	8.05	9.31
Basic & fabricated metal	2,215	44,597	1,815	40,584	10.64	11.22
Machinery & equip.	1,316	70,858	1,106	64,504	7.89	10.05
Transportation equip.	258	11,814	206	10,628	8.20	11.17
Furniture & repair	1,503	23,961	1,188	20,976	12.94	11.46
Water management	394	4,848	334	4,393	10.34	7.43
Services						
Trade	14,801	209,386	11,393	188,943	8.62	11.03
Transportation & storage	6,635	96,765	5,189	88,410	8.83	8.68
Publishing& audiovisual	796	19,859	594	17,477	11.98	11.95
Professional activity	10,897	149,758	7,636	127,900	15.71	13.75
Education & health	2,980	38,347	2,285	32,024	18.24	15.49

Table 1: Employment statistics for various industries of the Finnish economy. Results are averages over years 2005-2104.

Table 1 gives some general information on the structure of some industries of the Finnish economy. We can see that the service sector, which include trades, is characterized by a larger amount of firms and employees, on average. Moreover, it is interesting to see that most of the workers are located in staying firms. However, a considerable amount of employment is also due to entering and exiting firms, oscillating from 7 to 18 % points, depending on the industry (entrants and exiting firms account for a larger share of employees in the service industries).

Next, in Table 2, we report the industry level productivity growth rate and its components, in nominal terms. Productivity growths are computed using (2), over a 3-year period. In other words we calculate the growth rate from period $t-3$ to t. We present the averages over the sample period 2005-2014, using data from 2002.

	Productivity	Within	Between	Entry	Exit	Cross terms
Business Sector	4.94	5.10	−0.84	−1.62	−1.69	0.62
Manufacturing						
Food & Tobacco	7.38	6.47	0.69	−1.20	1.43	−0.11
Textile	7.85	3.08	2.36	0.93	0.69	0.79
Wood and paper	6.42	4.49	−1.58	−1.03	2.26	2.29
Chemical & Rubber	9.39	6.14	−0.58	−1.59	1.92	3.49
Basic & fabricated metal	7.51	4.94	1.15	−1.11	1.91	0.62
Machinery & equipment	9.57	6.27	3.11	−0.60	0.48	0.32
Transportation equipment	3.93	2.53	0.57	−0.57	−0.181	1.57
Furniture & repair	7.57	4.89	1.08	−0.33	1.29	0.64
Water & waste management	7.86	5.95	−0.71	−0.15	1.07	1.70
Services						
Trade	5.05	4.04	−0.11	−0.84	1.08	0.88
Transportation & storage	5.79	4.98	−0.19	0.25	0.20	0.55
Publishing & audiovisual	7.86	4.78	−0.39	2.59	−0.15	1.04
Professional activity	5.74	6.75	−0.97	−0.39	−0.062	0.43
Education & health	6.89	9.07	−1.03	−1.22	0.0008	0.12

Table 2: Industry-level productivity average growth rate and its components. Results are in nominal terms and are reported in percentage points.

Before we proceed with the analysis of the productivity results, we have to point out that our industry-level productivity growth rates present some differences from the ones published by the official statistical institute. This can be due to a multitude of factors, as pointed out in Bartelsman and Wolf (2014), e.g. the aggregation procedure adopted by Statistics Finland to obtain the official labour productivity measures. However, we find that the business sector's average productivity growth obtained from our micro-level data (which is 4.94 % points) is very close to the one based on official data (4.92 % points) so we are reassured about the quality of our dataset.

Turning our attention to the results of Table 2, we find that for most of the industries in the analysis, the within component is the main driver of the labour productivity growth rate. Two notable exceptions are the textile and the machinery and equipment industries, where the between component has a substantial contribution to productivity dynamics. Notice that the figures reported in Table 2 refer to nominal values. Next we report the real values for aggregate productivity and its components, obtained by using the implicit price deflator.

	Productivity	Within	Between	Entry	Exit	Cross terms
Business Sector	2.38	2.54	−0.84	−1.62	−1.69	0.62
Manufacturing						
Food & Tobacco	0.79	−0.11	0.69	−1.20	1.43	−0.11
Textile	6.41	1.64	2.36	0.93	0.69	0.79
Wood and paper	7.81	5.88	−1.58	−1.03	2.26	2.29
Chemical & Rubber	7.61	4.36	−0.58	−1.59	1.92	3.49
Basic & fabricated metal	3.72	1.14	1, 15	−1, 11	1.91	0.62
Machinery & equipment	4.68	1.38	3.11	−0.60	0.48	0.32
Transportation equipment	−2.25	−3.64	0.57	−0.57	−0181	1.57
Furniture & repair	−0.75	−3.44	1.08	−0.33	1.29	0.64
Water & waste management	−5.37	−7.28	−0.71	−0.15	1.07	1.70
Services						
Trade	2.41	1.41	−0.11	−0.84	1.08	0.88
Transportation & storage	3.90	3.09	−0.19	0.25	0.20	0.55
Publishing& audiovisual	0.70	−2.38	−0.39	2.59	−0.15	1.04
Professional activity	−7.93	−6.93	−0.97	−0.39	−0.062	0.43
Education & health	−6.03	−3.84	−1.03	−1.22	0.0008	0.12

Table 3: Industry-level productivity average growth rate and its components. Results are in real terms and are reported in percentage points.

First of all, it is important to remark that only the aggregate productivity growth and the within components are affected by changes in prices. The picture given by Table 3 is extremely different from what we have found by examining its nominal counterpart. Growth of real labour productivity has been, on average, negative or very weak for a large number of industries of the Finnish economy. This should not come as a surprise, given that our sample period includes the very difficult years of the Great Recession and onward. However, the overall business sector presents a mild positive growth rate of real productivity. It is also interesting to note that the importance of the within component, after we deflate its nominal values, is reduced with respect to the other components, in terms of explaining the evolution of aggregate real productivity growth.

4.2 The role of dependencies

We now proceed to the core of our analysis, i.e. we examine how the dependency status of a firm affects its employment growth and contribution to aggregate productivity. In this subsection, we do not discriminate between high growing enterprises and the rest, but we focus solely on the dependency status.

First, we present some employment-related statistics for dependent and independent firms belonging to the business sector. We consider micro, small and SMEs[1], where the size class is determined by using the average FTEs between year t and $t-3$, to prevent possible regression to the mean biases (this kind of approach has been addressed as dynamic classification method in the literature). We report average FTEs, job creation and destruction and the net job creation rate, relative to the employees working in a given class of enterprises.

	FTEs	Job Creation	Job Destruction	NJC(% points)
Micro				
Dependent	12,707	3,800	3,869	−0.6
Independent	158,646	58,640	47,000	7.3
Small				
Dependent	84,695	21,021	21,243	−0.3
Independent	311,473	101,083	78,793	7.2
Sme				
Dependent	246,791	57,895	60,123	−0.9
Independent	355,993	115,423	88,258	7.6

Table 4: Employment statistics for dependent and independent enterprises, considering all private businesses. Growths are computed on a three-year period and averaged over the time period of the analysis. The size class of the firms are defined based on the dynamic classification methodology.

It is interesting to see how visible is the positive relationship between a firm being dependent and its size. The dependent to independent FTEs ratio goes from 8%, for the micro enterprises, up to 70 % when we include small and medium firms. In other words, dependent enterprises tend to be larger than independent companies. Moreover, as noticed in Fornaro and Luomaranta (2016), dependent firms show a considerably lower net job creation rate, compared to independent companies.

Moreover, it is important to notice that the growth rate of firms (indicated by the net job creation rate) is fairly similar when considering different size groups, once we

[1]Notice that larger size classes include the smaller ones. We have checked the results of our analysis by excluding micro enterprises from the small and SME classes, but it did not change substantially our results.

control for their dependency status. For example, the difference in net job growth between micro independent firms and SMEs independent companies (which include, micro, small and medium firms) is only 0.3% points. This evidence is interesting with respect to the large literature on the effect of firm's size on job creation, indicating that the positive relation between small firms and high net job creation can be explained by their dependency status and not by the fact that they are small.

Next, we examine the productivity contributions of dependent and independent firms, for all private companies in the manufacturing and services sector. We also consider the business sector as a whole. The productivity contributions are reported both in absolute terms and as normalized components (i.e. dividing the productivity contribution by the employment share of the group under consideration), and are in real terms, where we deflate the nominal productivity contributions using the implicit price deflator. The results are reported in Table 5.

Looking at absolute components reported in Table 5, we can see a fairly clear pattern. First of all, both dependent and independent firm's contribution to aggregate productivity increases, in absolute terms, when we encompass small and medium firms in our analysis (on top of the micro ones). The effect, however, is much more pronounced for dependent enterprises. For example, we do not find an increase in the aggregate productivity of independent firms in the whole business sector, when switching from small firms to the small and medium enterprises class. However, for the dependent firms the productivity contribution increases more than twice when we expand our analysis from small to SMEs firms. Overall, we find that when considering solely micro enterprises, the contribution of the independent firms is higher for both the manufacturing and the business sector. This difference becomes smaller when considering also small companies (only 0.01 % points for the business sector), and it reverts when including also medium firms, with dependent firms having a larger contribution to productivity. For the service sector, dependent firms have always higher productivity contribution.

Turning to the components underlying the productivity contributions, we can see again some clear characteristics determined by the dependency status. When considering all private enterprises and the manufacturing sector, the within component of dependent firms is always smaller than the one of independent companies. On the other hand, the between component follows a behavior similar to the one of aggregate productivity,

	Absolute Components						Normalized Components					
	Prod.	Within	Between	Entry	Exit	Cross terms	Prod.	Within	Between	Entry	Exit	Cross Terms
Business Sector												
Micro												
Dependent	0.13	0.047	0.003	0.06	−0.034	0.04	10.9	4.18	0.30	5.01	−2.73	4.12
Independent	0.34	0.48	0.056	−1.00	0.94	−0.14	2.59	3.61	0.42	−6.52	6.11	−1.02
Small												
Dependent	0.62	0.21	0.08	0.15	−0.01	0.17	7.62	2.71	1.06	1.85	−0.22	2.22
Independent	0.63	1.04	0.01	−1.54	1.46	−0.35	2.28	3.73	0.07	−5.09	4.84	−1.26
SME												
Dependent	1.39	0.64	0.14	0.15	0.08	0.35	5.81	2.72	0.61	0.63	0.37	1.45
Independent	0.56	1.14	−0.03	−1.75	1.61	−0.42	1.79	3.56	−0.10	−5.05	4.68	−1.30
Manufacturing												
Micro												
Dependent	0.06	0.03	0.004	−0.004	0.01	0.004	11.62	7.32	0.87	−0.64	3.18	0.89
Independent	0.62	0.35	0.09	−0.02	0.21	−0.02	7.84	8.33	0.07	−5.58	6.80	−1.77
Small												
Dependent	0.62	0.35	0.09	−0.02	0.21	−0.02	7.48	5.59	1.47	−0.08	0.77	−0.26
Independent	1.24	1.45	−0.06	−0.73	0.88	−0.29	6.90	8.26	−0.39	−3.16	3.80	−1.61
SME												
Dependent	2.59	1.62	0.44	−0.22	0.75	−0.004	9.56	6.00	1.66	−0.82	2.74	−0.02
Independent	1.42	1.75	−0.12	−0.90	1.05	−0.35	6.36	7.84	−0.54	−3.88	4.51	−1.57
Services												
Micro												
Dependent	0.08	−0.01	0.0002	0.14	−0.11	0.05	4.88	−0.91	−0.01	9.14	−7.00	3.66
Independent	−0.15	−0.30	0.15	−0.66	0.69	−0.02	−0.96	−1.91	0.95	−3.69	3.84	−0.15
Small												
Dependent	0.08	−0.20	0.05	0.25	−0.29	0.27	0.91	−2.20	0.56	2.75	−3.11	2.92
Independent	−0.54	−0.55	0.22	−1.08	1.02	−0.14	−1.75	−1.83	0.75	−3.33	3.14	−0.29
SME												
Dependent	−0.31	−0.44	−0.05	−0.27	−0.55	0.45	−1.34	−1.89	−0.21	1.18	−2.38	1.97
Independent	−0.88	−0.65	0.12	−1.34	1.12	−0.16	−2.53	−1.92	0.37	−3.59	3.07	−0.46

Table 5: Contributions of dependent and independent SMEs to the productivity of the main sectors of the economy. Results are in real terms and are reported in percentage points.

i.e. the dependent subgroup has larger between component as we include small and medium firms in the analysis. In practice, firms in the independent group have larger productivity growth but the reallocation of labour toward more productive firms is more pronounced in the dependent class. This can be explained by the fact that large companies are able to reallocate labour among subsidiaries and mother companies in a easier fashion, while the independent class might face large frictions in reallocating jobs. Finally, the entry and exit components of independent firms are much higher than the ones of their dependent counterparts. It is especially interesting to see that the entry component of independent firms is fairly large and negative, while for the dependent firm is positive, albeit small. Entrants in the dependent group seem to provide an improvement of the level of productivity, while in the independent class new firms are considerably less productive than incumbents. The exit component of the dependent companies is smaller than the one of the independent group, for all cases considered. This means that exiting firms in the independent class are improving the group's productivity by leaving the market. The high correlation between the absolute size of the entry and exit components has been documented in the literature, see Hyytinen and Maliranta (2013), and points towards the fact that inefficient entrants tend to leave quickly the market. For the service sector, all components are usually larger for dependent firms than for independent ones, with the exception of the exit component.

The second half of Table 5 contains the normalized components, which take into account the difference in employment shares and thus indicate the contributions of the typical firm belonging to the group of interest. First of all, it is interesting to see that the productivity contribution is always larger for dependent firms, regardless of sector or size considered. For the within and between components, we find important differences when looking at different sectors and size classes. For example, for manufacturing firms we find that the average independent company has a larger within component, but lower between term. In the services, we see that the within component is slightly higher for dependent companies, while the reverse is true of the between component. For the entire business sector, we find a similarly mirroring relationship for the within and between components of dependent and independent firms. The average dependent company has a larger within component when considering the micro class, while the contrary is true for the case in which we include small and medium firms. The between

component follows the opposite pattern with larger values for independent micro firms and lower values for the independent small and SMEs groups. Turning to the entry and exit components, we see a consistent discrepancy between firms of different dependency status. Enterprises owned by a mother company exhibit a larger entry component and a lower exit component than their independent counterpart. Interestingly, the entry component of dependent companies is negative only for the manufacturing sector, indicating that the typical entrant of this class is actually more productive than the typical incumbent for the business sector as a whole and the service industry. On the other hand, for independent firms the normalized entry component is always negative. We, find the opposite for the exit component, with the typical exiting dependent firm having a negative effect on the productivity contribution (negative exit component). This is not true, however, for the manufacturing industry. For independent firms, we find that firms leaving the market improve the industry productivity by exiting, disregarding size class or industry.

Overall, we can draw few interesting conclusions from Table 5. First of all, the typical dependent firm tend to have a larger productivity contribution (once we take into account its employment share), however the contribution in absolute terms depend on what size class we consider. Another interesting result is that the within component tends to be higher for independent firms but the contrary holds for the between component. Finally, and probably one of the most striking results, the entry and exit components follow diametrically opposite paths based on the dependency status, with the entry component always higher for dependent firms and the exit component lower. Interestingly, the entry component, when considering the business sector as a whole, is positive for dependent firms. This indicates the fact that entrant which are dependent tend to have higher labour productivity levels than incumbents.

4.3 HGF analysis

In this subsection, we focus on high growth enterprises. These are defined as firms with an an annual growth of FTEs of 20%, calculated over a three year period. In Table 6, we report few employment statistics for HGFs. We use different size classes for HGFs, i.e. micro enterprises, small companies and SMEs (where larger size classes contain the smaller ones). The original definition of HGF focused on non-micro businesses, to avoid the possible growth biases of very small enterprises. We consider them to remain in

line with the rest of the analysis of this paper.

	FTEs	Job Creation	NJC(% points)
Micro			
Dependent	1,033	891	86
Independent	12,626	10,404	82
Small			
Dependent	6,803	6,141	90
Independent	26,043	22,130	85
Sme			
Dependent	19,016	17,995	94
Independent	30,083	25,697	85

Table 6: Employment statistics for dependent and independent enterprises, considering all private businesses.

We find again the positive relation between the size class and the dependency status, i.e. dependent firms tend to be overrepresented in the small and medium class. Interestingly, we find that their job creation (relative to the FTEs of the group) is higher than the one of independent companies. In other words, the dependent HGFs category has grown more than its independent counterpart. Interestingly, the growth rate of independent companies is fairly stable when we encompass larger size classes, while the one of dependent companies steadily increases when we go from micro to small and medium firms. Notice that, when we consider HGFs, the gross job creation is equivalent to the net job creation, by definition.

Next, in Table 7, we report a similar productivity decomposition as in Table 5, this time including only HGFs. We consider micro, small and medium SMEs, where the latter group encompasses the smaller size classes, for the manufacturing, services and business sectors.

Looking at the results reported in Table 7, we notice that HGFs have a tendency to have a negative contribution to aggregate productivity. The only exceptions are found for dependent, micro HGFs in the business and service sectors. For independent companies, the contribution is always negative. We are going to expand on this result later in this subsection.

Another important point is that the contribution of dependent HGFs is always higher, or at least less negative, than the one of independent enterprises. However,

	Absolute Components						Normalized Components					
	Prod.	Within	Between	Entry	Exit	Cross terms	Prod.	Within	Between	Entry	Exit	Cross Terms
Business Sector												
HGF Micro												
Dependent	0.01	−0.007	0.027	0	0	−0.01	6.99	−5.93	24.58	0	0	−11.6
Independent	−0.33	−0.08	−0.22	0	0	−0.03	−24.54	−5.86	−16.38	0	0	−2.30
HGF Small												
Dependent	−0.06	−0.064	0.088	0	0	−0.08	−8.64	−8.67	12.12	0	0	−12.09
Independent	−0.72	−0.14	−0.48	0	0	−0.08	−25.56	−5.05	−17.35	0	0	−3.16
HGF SME												
Dependent	−0.33	−0.20	0.29	0	0	−0.42	−15.84	−9.96	14.60	0	0	−20.70
Independent	−0.89	−0.16	−0.59	0	0	−0.11	−27.25	−5.20	−18.18	0	0	−3.85
Manufacturing												
HGF Micro												
Dependent	−0.007	0.0003	−0.0008	0	0	−0.007	−18.42	0.96	−2.12	0	0	−17.22
Independent	−0.12	−0.0003	−0.11	0	0	−0.008	−27.91	−0.07	−25.78	0	0	−2.06
HGF Small												
Dependent	−0.35	−0.17	0.10	0	0	−0.28	−94.44	−44.99	26.98	0	0	−74.02
Independent	−0.36	−0.06	−0.31	0	0	−0.04	−35.33	−0.57	−28.35	0	0	−3.99
HGF SME												
Dependent	−0.33	−0.15	0.10	0	0	−0.28	−26.57	−12.13	8.26	0	0	−22.71
Independent	−0.35	0.0002	−0.31	0	0	−0.04	−26.02	0.01	−22.81	0	0	−3.21
Services												
HGF Micro												
Dependent	0.016	−0.017	0.081	0	0	−0.047	10.82	−10.90	52.924	0	0	−31.20
Independent	−0.29	−0.19	−0.05	0	0	−0.048	−19.15	−12.20	−3.81	0	0	−3.14
HGF Small												
Dependent	−0.03	−0.13	0.23	0	0	−0.13	−3.30	−13.96	24.61	0	0	−13.94
Independent	−0.68	−0.36	−0.21	0	0	−0.09	−21.53	−11.70	−6.88	0	0	−2.95
HGF SME												
Dependent	−0.22	−0.32	0.70	0	0	−0.60	−8.85	−12.83	27.93	0	0	−23.95
Independent	−0.91	−0.42	−0.36	0	0	−0.10	−24.34	−11.52	−9.93	0	0	−2.89

Table 7: Contributions of dependent and independent HGFs to the productivity of the main sectors of the economy. Results are in real terms and are reported in percentage points.

this is not true for the manufacturing sector when considering the small size class and the SMEs, with the productivity contributions in absolute term very similar between firms of different dependency status. The within component follows a similar pattern as the aggregate productivity contribution, i.e. higher for dependent firms except for the manufacturing sector. The between component is always higher, and almost in every case positive, for dependent HGFs. Interestingly, the cross terms is substantial and strongly negative for dependent companies, and it is mainly driven by the within component cross term. As pointed out in Section 2, a negative within component cross term indicates that low productivity HGFs which are dependent have a much larger catching-up factor, compared to their independent counterparts.

The results relative to the normalized components confirm what we have discussed so far: dependent firm have higher productivity contributions (with the exception of manufacturing small and SMEs categories), the between component is always larger (and mostly positive) for dependent companies and that the latter have large cross terms, mainly driven by the beta-convergence. Additionally, when we look at the normalized components, we see that the within term is usually larger (albeit negative) for independent HGFs. Notice that because we are considering HGFs, which are stayers by definition, we do not have the entry and exit components.

As pointed out earlier, one of the most striking results of the HGFs' analysis is that they contribute negatively to aggregate productivity. This can be explained by the fact that we are examining the productivity growth during the time of expansion of the firm. It is plausible that during this time of heavy investments, indicated by the growth of FTEs, these fast growing businesses are actually targeting the long-term productivity level for future years. This consideration makes the analysis of the subsequent years after an enterprises is included in the high growth class particularly interesting. In Table 8, we examine the net job creation and productivity contribution of HGFs during the three years after they have grown. In other words, we examine the performance of HGFs, defined as such based on their $t-3$ to t growth, from time t up until $t+3$.

First, we examine the net job creation of HGF in the period t to $t+3$. We consider net job creation in normalized terms, i.e. we look a the average growth rate in size of firms in the dependent and independent class, abstracting away from the actual contribution to aggregate job creation. We see that even in the subsequent years after their rapid increase in size, HGFs tend to have positive net job creation rates for all size

		Absolute Components				Normalized Components			
	NJC(% points)	Prod.	Within	Between	Cross terms	Prod.	Within	Between	Cross Terms
Business Sector									
HGF Micro									
Dependent	28	0.01	0.01	0.021	−0.02	6.16	6.16	14.27	−14.26
Independent	10	0.02	0.20	−0.05	−0.12	0.93	10.89	−3.06	−6.90
HGF Small									
Dependent	20	0.01	0.058	0.056	−0.10	1.33	5.70	5.52	−9.88
Independent	8	0.01	0.37	−0.095	−0.27	0.24	9.89	−2.50	−7.15
HGF SME									
Dependent	11	−0.15	0.08	0.02	−0.24	−5.02	2.71	0.61	−8.34
Independent	6	0.07	0.42	−0.09	−0.26	1.49	9.58	−2.09	−6.0
Manufacturing									
HGF Micro									
Dependent	15	−0.002	0.002	0.001	−0.005	−4.19	4.40	2.27	−10.86
Independent	2	0.006	0.08	−0.03	−0.04	1.01	12.84	−4.86	−6.98
HGF Small									
Dependent	12	−0.02	0.04	0.0008	−0.05	−2.96	7.64	0.17	−10.77
Independent	2	−0.01	0.14	−0.05	−0.09	−0.45	9.02	−3.62	−5.85
HGF SME									
Dependent	5	−0.07	0.063	−0.02	−0.11	−3.90	3.50	−1.25	−6.16
Independent	0.6	0.00	0.17	−0.06	−0.11	−0.03	8.82	−3.28	−5.57
Services									
HGF Micro									
Dependent	27	0.027	0.004	0.05	−0.02	13.36	1.89	24.53	−13.05
Independent	11	0.004	0.10	0.008	−0.10	0.21	5.10	0.40	−5.29
HGF Small									
Dependent	21	0.06	0.02	0.15	−0.12	4.49	1.70	12.09	−9.30
Independent	10	0.00	0.26	−0.001	−0.27	−0.06	6.24	−0.03	−6.27
HGF SME									
Dependent	13	−0.11	−0.027	0.16	−0.24	−2.89	−0.76	4.43	-6.57
Independent	7.5	−0.02	0.29	0.002	−0.31	−0.36	5.85	0.06	−6.27

Table 8: Contributions of dependent and independent HGFs to the productivity of the main sectors of the economy. Results refer to the subsequent 3-year period after the HGFs are observed. Results are in real terms and are reported in percentage points.

class and sectors, with slightly lower growth rates in manufacturing. However, these growth rates are much smaller than the ones we observe when defining and enterprise as high growing. Importantly, it is interesting to notice that dependent firms have higher net job creation rates for all cases considered, maintaining a similar results as in Table 7.

Turning to productivity, we find that the contribution of HGFs increases w.r.t to the results of Table 7 and sometimes these contributions become positive, e.g. when looking at the independent HGFs for the overall business sector. It seems that fast growing enterprises manage to improve their productivity fairly quickly and these findings suggest a sort of experimentation and investment phase of young HGFs, during their initial years of existence. After growing in size, perhaps in order to set up the company, these enterprises tend to have a better performance in the subsequent years, conditional on staying in the market.

The relation between dependency status and productivity contributions becomes slightly more blurry compared to the rest of the results obtained so far. In particular, the size class and sectors under consideration play a role in this regard. For example, we see that the productivity contribution of independent firms is higher in the manufacturing sector, both in absolute and normalized terms, for all size classes. Looking at services, we see that the normalized contribution of dependent firms is higher for both micro and small firms, but the result reverts in the case where we also include medium enterprises. The same pattern of the service sector is found when we look at all private businesses. One possible interpretation of this finding can be that in the manufacturing sector a dependent firm does not benefit too much from having possible access to the know-how and human capital of the large mother company, while this advantage can be more substantial in an industry like the service one.

In regards to the actual components underlying the productivity contribution, we find similar results as before. The within component, i.e. how the productivity of firms in a subgroup develops over time, is consistently higher for independent firms, while the reverse holds for the between component. The productivity growth of an independent firm tends to be higher compared to its dependent counterpart, but there is a more efficient job reallocation among subsidiaries, i.e. more productive enterprises in the dependent category tend to have larger growth rates of FTEs than in the independent group.

4.4 Productivity, dependencies and firm's age

The analysis we have performed so far has been centered on the relation between dependency status and productivity, after we control for firm's size. As pointed out in numerous examples in the literature (c.f. Hyytinen and Maliranta, 2013 and Haltiwanger et al., 2013) one of the main characteristics of an enterprise, which influences its employment generation and production, is the age. It has been shown that age is a crucial factor in explaining the heterogeneity of the job creation among different firms and that size differences, after controlling for age, do not have a significant effect on the net job creation of firms. In the light of these considerations, it is important to see if our conclusions about the relation between the dependency status of a firm and its productivity contributions are valid after we control for the age of the firm. In our case, it might be that dependent firms tend to be older and that can be the driver of our results.

To do this, we apply the productivity decomposition described in section 2.2 while considering dependent and independent enterprises belonging to different age classes. We consider stayers that are 0-4, 5-9, 10-14 and 15 or more years old. To define a firm's age, we rely on its administrative identity code. While this approach is not without flaws, specifically a change in the i.d. code of the firm would lead us to consider it as newly formed one, we can be reassured by the fact that the change in status from independent to dependent, and vice versa, does not imply a change in the identification number of the enterprise. In other words, if a firm becomes dependent during its lifetime, we are going to keep track of its age correctly. Moreover, it is not entirely clear if the dependent category is more susceptible to this problem and to what degree. The use of establishment data can help in this regard, but would create a number of other problems such as establishment's ownership changes or higher difficulty in determining the dependency status of the establishment.

In Table 9, we report the decomposition results for real productivity, using both the normalized and absolute terms. We examine SMEs belonging to the manufacturing and service sector, together with the whole population of private small and medium businesses. Because we are focusing on stayers, we do not have the entry and exit components that were present in, e.g., Table 7.

Looking at the results of Table 9, we find a confirmation of what we have seen so far. Dependent firms tend to have a larger productivity contribution for most of the cases

examined. The only exceptions, for the absolute terms, are the 15 or more years old enterprises for the business and service sectors (even though for the latter the difference is very small). When we look at the normalized terms, we find that dependent firms have always higher labour productivity contributions except for enterprises belonging to the oldest age class in services. Moreover, we find again the tendency of dependent firms to have larger between terms and smaller within components, at least for the manufacturing sector and the whole business population. It is important to point out that the age class of a firm has a substantial effect on its productivity. For example, the productivity contribution of the typical dependent firm (i.e. the normalized term) belonging to the 5-9 years class is almost double of the one of a typical dependent enterprise in the 0-4 years class. Notice also that the peak of productivity is achieved earlier by dependent firms, regardless of the industry considered.

Overall, we find that while age is an important source of heterogeneity of firms' productivity contribution, a result that has been confirmed numerous times throughout the literature. However, we can be confident of the presence of a dependency effect, even after controlling for the age of the firm.

4.5 Effects of foreign ownership

So far, we have looked at dependent enterprises regardless of their degree of dependency (how big is the share of the small firm owned by the mother company) and the characteristics of the mother company. However, there have been multiple studies in the literature, and in the public debate around firms' productivity, where the presence of foreign enterprises is scrutinized. An example of the potential mechanisms that can explain why the location of the owning firm matters is described Bloom, Sadun, and John (2012), where they show that U.S. companies that are present in Europe are able to benefit from more advanced I.T. in the U.S., and that the complementary human resource practices provide them a competitive advantage over European competitors. Many empirical papers have studied the impact of foreign ownership on firm performance, usually finding a positive relationship (some examples are Benfragello and Sembenelli, 2006 for Italy, Criscuolo and Martin, 2009 for U.K., and Gelübcke, 2013 for Germany). For Finland, Ilmakunnas and Maliranta (2004) document a positive impact of foreign ownership on productivity in manufacturing establishments. The Nordic statistical offices joint with the OECD have recently produced a study for the Nordic Council

	Business Sector				Manufacturing				Services			
	Prod.	Within	Between	Crossterm	Prod.	Within	Between	Crossterm	Prod.	Within	Between	Crossterm
Absolute Terms												
0-4 Years												
Dependent	0.04	0.05	0.001	-0.01	0.028	0.023	0.033	-0.03	0.02	0.03	-0.007	-0.0005
Independent	-0.10	0.09	-0.14	-0.05	-0.003	0.08	-0.05	-0.03	-0.13	0.03	-0.10	-0.05
5-9 Years												
Dependent	0.33	0.16	0.017	0.15	0.41	0.26	0.03	0.11	0.11	-0.03	0.26	-0.11
Independent	-0.01	0.23	-0.11	-0.12	0.11	0.23	-0.07	-0.04	-0.20	-0.09	-0.05	-0.06
10-14 Years												
Dependent	0.20	0.08	0.10	0.003	0.29	0.24	0.07	-0.027	0.026	-0.09	-0.001	0.12
Independent	0.17	0.22	0.01	-0.07	0.21	0.30	-0.03	-0.06	-0.07	-0.11	0.09	-0.04
15 or More Years												
Dependent	0.57	0.35	0.01	0.20	1.35	1.08	0.30	-0.04	-0.22	-0.34	-0.30	0.42
Independent	0.71	0.59	0.20	-0.08	1.00	1.13	0.04	-0.016	-0.20	-0.47	0.18	0.08
Normalized Terms												
0-4 Years												
Dependent	4.60	5.99	0.22	-1.61	3.50	2.92	4.17	-3.59	2.68	3.62	-0.87	-0.06
Independent	-7.56	6.83	-10.34	-4.03	-0.37	11.65	-8.15	-3.87	-8.50	1.81	-6.61	-3.70
5-9 Years												
Dependent	8.02	3.97	0.41	3.63	9.10	5.91	0.65	2.53	2.87	-0.72	6.44	-2.86
Independent	-0.12	3.97	-1.93	-2.14	3.89	8.00	-2.67	-1.42	-3.04	-1.34	-0.81	-0.87
10-14 Years												
Dependent	5.27	2.30	2.91	0.05	7.11	5.90	1.85	-0.64	0.69	-2.47	-0.031	3.18
Independent	3.01	3.97	0.32	-1.28	6.52	9.25	-0.91	-1.82	-1.07	-1.83	1.48	-0.73
15 or More Years												
Dependent	3.79	2.31	0.10	1.37	7.72	6.18	1.75	-0.21	-1.52	-2.36	-2.06	2.90
Independent	3.68	3.08	1.04	-0.45	6.55	7.34	0.28	-1.06	-1.08	-2.47	0.97	0.40

Table 9: Contributions of dependent and independent SMEs, separated in different age groups, to the productivity of the main sectors of the economy. Results are in real terms and are reported in percentage points

of Ministers, where one of the key messages is that the foreign multinationals present in the Nordics are very important in terms of contribution to the main economic variables, and especially so in terms of exports (NMR, 2016). Given the apparent policy interest towards foreign multinationals, and as our data allows for distinguishing foreign-owned dependent SMEs from the domestically owned dependent SMEs (we define ownership as mother having over 50% stake), we provide some further evidence on the economic effects of foreign ownership. This can also point towards future research avenues by demonstrating how one can fine-tune the dependency definition by looking at the identities and types of the larger groups from which the SME firm is dependent (e.g. geographical location, size, organizational structures, management practices, and financial conditions).

We analyze the productivity contributions of foreign-owned SMEs compared to the companies owned by a large Finnish corporation. In other words, does the foreign ownership have an effect on the productivity of a small firm, on top of the actual dependency effect? We report the productivity decomposition for foreign-owned versus the rest of dependent SMEs belonging to the manufacturing and service sector, together with all private businesses in Table 10.

	Absolute Components						**Normalized Components**					
	Prod.	Within	Between	Entry	Exit	Cross terms	Prod.	Within	Between	Entry	Exit	Cross Terms
Business Sector												
Foreign-owned	0.26	0.09	0.29	0.13	−0.14	−0.11	2.57	0.92	2.92	1.56	−1.69	−1.13
Other Dependent	−0.06	0.15	0.44	−1.02	0.66	−0.30	−0.44	0.68	1.91	−4.84	3.13	−1.33
Manufacturing												
Foreign-owned	0.90	0.51	0.35	0.09	0.13	−0.18	9.43	5.31	3.64	0.97	1.38	−1.87
Other Dependent	1.38	1.20	0.42	−1.30	1.24	−0.18	5.80	5.00	1.74	−4.90	4.68	−0.72
Services												
Foreign-owned	−0.30	−0.44	0.12	0.28	−0.31	0.04	−2.71	−4.99	1.14	2.52	−2.74	0.36
Other Dependent	−1.67	−0.97	−0.10	−0.51	−0.02	−0.26	−7.60	−4.63	−0.47	−2.08	−0.09	−1.25

Table 10: Contributions of foreign owned dependent and domestic dependent to the productivity of the main sectors of the economy. Results are in real terms and are reported in percentage points.

Table 10 gives some interesting additional insights over how different types of dependencies affect the productivity of small enterprises. The absolute components are slightly hard to interpret, given that they are affected by the employee share of the classes under consideration, but they tell that for the business sector and the services foreign owned SMEs have a relatively higher productivity contribution, compared to the rest of the dependent enterprises. For the manufacturing, however, the small and

medium enterprises controlled by a Finnish mother company have a larger contribution.

The normalized component are easier to read, because they abstract from the input share of the classes of firms under consideration. Looking at them, we see that across the industries of interest, foreign owned SMEs have a larger (or at least less negative, in the case of services) productivity contribution. This result does not seem driven by the within-firm growth of stayers (the within component), which is fairly similar between the two types of dependent enterprises under consideration, rather by the better reallocation of jobs toward more productive firms and the higher productivity of foreign-owned entrants. In particular, the between component for the dependent firms with foreign mother company is higher for all 3 sectors of interest. Moreover, the entry components is substantially higher for this group. It is important to note that in this analysis we are omitting all independent enterprises, so the fact that the entry components of dependent companies (controlled by a domestic enterprise group) is negative can still be reconciled with the results of Table 5. Domestically dependent entrants are more productive than incumbents when including also independent companies, but are less productive than dependent stayers. On the other hand, new firms that are foreign controlled seem to be more productive than the average dependent incumbent.

4.6 A closer look at the evidence: tentative interpretation

The key contribution of our study is to describe the role of firm dependencies in explaining aggregate productivity dynamics and it warrants some additional consideration. We try to provide some context to our results and motivate further research to understand them.

Let us restate some of our key findings:

1) Dependent firms contribute more to the aggregate productivity than the independent ones.

2) Dependent firms reach their productivity peak faster, regardless of size and industry.

3) We document a positive entry component for dependent enterprises, meaning that newly created dependent firms are already more productive from the start than an average firm in the sector of consideration.

4) Productivity contribution of dependent companies is largely derived from the between component, meaning that less productive firms reduce their input share in favor of more productive ones, or vice versa the more productive firms increase their input share at

the expense of the less productive ones.
5) Foreign control can have a positive impact on productivity contribution, as documented in the earlier empirical literature, and the effect is visible also when compared to other dependent SME firms.

Empirical evidence in the management science literature points toward better management practices being the key in explaining productivity differentials (see, among others, Black and Lynch, 2001, Bloom and Reenen, 2007, Bloom, Sadun, and Reenen, 2016, and Bloom et al., 2012). This can explain higher productivity of (foreign) dependent firms if they can benefit from the managerial know-how and best practices in the larger firm network of other affiliated firms.

Studies like Brynjolfsson, McAfee, Sorell, and Zhu (2008) and Gabler and Poschke (2013) analyze the experimentation channel in relation to productivity growth and aggregate productivity. The fact that dependent firms reach their productivity peak faster and have a positive entry component could be understood in terms of a smoother experimentation process and having to bear less productivity risk (in trying out new products or processes), if the experimentation process has already been carried out elsewhere in the group.

Selection models such as Jovanovic (1982) can provide insights as to how independent firms experience higher growth rates in size while the dependent entrants do not grow in size but achieve their peak productivity at a faster rate. The key ingredient in the model is the uncertainty parameter of one's true "type" which updates every period. In the early years (post-entry) the impact of updates is stronger and drives greater growth rates among survivors. In this view, the benefits of the information in the larger group could be interpreted in terms of reduced uncertainty about the true type of the dependent firm.

Atalay et al. (2014) provide recent and related empirical evidence from the manufacturing establishments in the U.S. census. Their data shows that ownership of production chains (vertical integration) does not seem to imply transfers of physical inputs from upstream establishment to downstream establishments. On the contrary: the authors argue, that the main motivation of ownership lies in the fact that it promotes efficient intrafirm intangible input transfers, such as managerial skills. A crucial observation in their paper is the fact that, after a change in ownership, the acquired establishment start to resemble the acquiring firm, thus capitalizing on the competitive advantages

that the owning firm may have. These can include access to specific export markets, organizational best practices and the experienced managers that may come along. A more theoretical view is offered in the model in Hart and Holmström (2010), which is based on an idea that managerial authority is limited by firm boundaries, and helps in explaining why formally integrating other firms (as opposed to contracting) is helpful in spreading managerial talent to handle more productive assets.

In the standard economics literature, firms adjust their labour based on some some (unobserved) adjustment cost function (see e.g. Hamershmesh and Pfann, 1996 for a survey). Firm heterogeneity can explain some of the differential labour market outcomes (as in Gal, Hijzen, and Wolf, 2013). In this article, we provide another important source for heterogeneity impacting the rate at which businesses adjust labour inputs (or their adjustment cost functions), namely the external ownership and control. The fact that dependent firms' between component contributes positively to aggregate productivity can be an indication of greater efficiency in adjusting productivity levels to firm level shocks. This can be a result from decisions imposed to dependent firms elsewhere in the firm's ownership network. In the search and matching literature (see the early model in Mortensen and Pissarides, 1994), some new modifications of the model (e.g. Petrosky-Nadeau and Wasmer, 2013) have used financial constraints to understand how employee-employer matching becomes more difficult (and thus explaining the heterogeneity in adjusting the labour input demand to different market conditions). It is likely, that better access to credit is one of the most obvious advantages in belonging to a large group.

5 Conclusions

In this paper, we have looked at the productivity growth contributions due to dependent and independent micro, small and medium firms. We find that dependent enterprises exhibit consistently larger productivity contributions, especially when we take into consideration their employment share (the normalized terms). This result is not affected by the size class considered and holds for the three main industries under consideration, i.e. the manufacturing, services and the whole business sector. Interestingly, the higher productivity contribution of dependent SMEs is not driven by a higher growth rate of the productivity within firm, but rather by the reallocation of labour towards more productive enterprises. Even more clear is the discrepancy between dependent

and independent firms w.r.t. the effect of entrants. Dependent firms show a much larger entry component, which is often positive throughout our results for subsidiaries, indicating that entrant which are dependent improve the overall productivity level of the industry considered. For independent firms, the entry component is always negative, a result widely reported in the previous literature.

In addition, we demonstrate how the dependency status can be fine-tuned further, by looking at the characteristic of the owning firm. More specifically, we show that the foreign owned SMEs are contributing positively to the productivity of the entire dependent SME group, and this is mainly due to more efficient labour input adjustments towards more productive firms. This can be interesting from the policy-design perspective, if things can be improved at domestically owned firms by just trying to understand the reasons for this result (or perhaps trying to accelerate the positive spillovers).

Considering HGFs, we find a substantial confirmation of our results, i.e. dependent high growing enterprises have larger productivity contributions, strongly driven by the reallocation of labour input to more productive firms. The productivity contribution for HGFs, however, is usually strongly negative, regardless of the size class, dependency status and industry considered. If we look at the performance of these firms during the 3 years after they have been classified as high growing, their productivity contributions become less negative and in some cases positive. The effects of the dependency status remain largely similar to what is found in the main analysis.

Finally, we examine SMEs belonging to different age groups, to verify that the effects of the dependency status are not driven by the age of the firm. We find that, regardless of the age group, dependent firms exhibit larger productivity contributions, smaller within components and larger between components. Moreover, dependent firms reach their productivity peak earlier than their independent counterparts.

Overall, we establish that Finnish dependent SMEs in the manufacturing, services and total business sectors, have a had a larger contribution to aggregate productivity, regardless of their size class or age. In particular, this result seems to be driven by the more effective reallocation process among dependent enterprises and especially by the fact that dependent entrants tend to have larger productivity levels than the incumbents.

While the analysis of this paper is mainly descriptive, we can find some intuitive explanation behind our results. As we pointed out above, one of the key drivers of

the higher productivity of dependent SMEs is the larger entry component. This could be interpreted in the light of a smoother experimentation process (see, among others, Brynjolfsson et al., 2008 and Gabler and Poschke, 2013) undergone by subsidiaries. An independent small company entering the market has typically an uncertain view of its own productivity potential, which can lead to an initial difficulty reflected in lower productivity. This is also mirrored in the age groups results, where independent firms achieve higher productivity in the later years of their lifespan. On the other hand, dependent companies might have a better idea of their actual potential, possibly because they need to perform a restricted range of tasks assigned by the mother company, and this is reflected in higher entry component and by the fact that they reach their peak-productivity earlier than their independent counterparts.

Our analysis can be extended in a number of ways. First of all, we have focused on labour productivity while it can be interesting to see if our results hold when analyzing total factor productivity. Moreover, it could be interesting to see how the dependency status of a firm affect their contribution to wage dynamics. The use of establishment data could provide interesting developments, even though it would pose a number of problems in terms of the determination of the dependency status and other data issues. It would be very interesting to study different aspects of interactions inside the enterprise groups; for example, are more profitable firms receiving more resources at the expense of the less profitable firms, within the same corporation? Finally, it would be useful to exploit the identities and characteristics of the controlling firms, to better understand the various mechanisms behind our results.

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