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Productivity Dynamics of Mergers, Acquisitions and Restructuring

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Abstract

A substantial share of firm entry and exit observed in register-based data reflects mergers, acquisitions, spin-offs, and other forms of corporate restructuring, instead of genuinely new firms or firm closures. This distinction is important for productivity decompositions, which typically interpret market entry and exit as manifestations of the Schumpeterian creative destruction. Using linked register-based data on Finnish manufacturing firms and employees for the period 2010–2022, we identify restructuring events through clustered worker flows, and incorporate this classification into a structural productivity decomposition framework. The results show that firms involved in restructuring events exhibit significantly higher productivity levels than genuinely entering or exiting firms. Nevertheless, the contribution of restructuring-related entry and exit to aggregate productivity growth remains modest, whereas genuine creative destruction by newly established firms and closing down make a larger positive contribution to productivity growth. Firms undertaking acquisitions exhibit a temporary decline in labor productivity around the time of acquisition, followed by a gradual recovery. These findings highlight the need to distinguish restructuring events from genuine market entry and exit when analyzing productivity dynamics.

Tiivistelmä

Tuottavuuskehitys yritysostoissa, fuusioissa ja muissa yritysjärjestelyissä

Merkittävä osuus tilastoaineistoissa havaittavasta yritysten markkinoille tulosta ja markkinoilta poistumisesta liittyy yritysjärjestelyihin, kuten fuusioihin, yritysostoihin, jakautumisiin ja muihin yritysrakenteen muutoksiin. Perinteisesti markkinoille tulo ja poistuminen tulkitaan schumpeterilaisen luovan tuhon ilmentymiksi, joten yritysjärjestelyjen erottaminen aidosti uusista ja lopettavista yrityksistä on tärkeä tuottavuuskehityksen kokonaiskuvan hahmottamiseksi. Tässä tutkimuksessa hyödynnetään suomalaisia teollisuus- ja palvelutoimialojen yrityksiä ja niiden työntekijöitä koskevaa yhdistettyä rekisteriaineistoa vuosilta 2010–2022. Yritysjärjestelyt tunnistetaan aineistosta työntekijävirtojen perusteella. Tulokset osoittavat, että yritysjärjestelyihin osallistuvien yritysten työn tuottavuuden taso on keskimäärin selvästi toimintansa lopettavia tai aidosti uusia yrityksiä korkeampi. Siitä huolimatta schumpeterilaiseen luovaan tuhoon liittyvä aidosti uusien yritysten markkinoille tulo ja lopettavien yritysten poistuminen edistävät tuottavuuden kasvua selvästi enemmän kuin yritysjärjestelyihin liittyvä markkinoille tulo ja markkinoilta poistuminen. Yritysostoja toteuttavien yritysten työn tuottavuus heikkenee tilapäisesti yritysoston yhteydessä, mutta palautuu vähitellen tämän jälkeen. Tulokset korostavat yritysjärjestelyjen ja aidon markkinadynamiikan erottamisen merkitystä yrityssektorin tuottavuuskehityksen taustalla.

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Asiasanat: Työn tuottavuus, Yritysjärjestelyt, Työntekijävirrat, Yritysdynamiikka, Tuottavuushajotelma

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1 Introduction

Technological progress is generally considered to be the key driver of productivity growth in the long run. Structural change of industries through market entry and exit has been widely recognized as another major source of productivity growth since the 1990s (Baily et al., 1992; Griliches and Regev, 1995; Olley and Pakes, 1996). Several subsequent works have extended the static Olley and Pakes (1996) decomposition to incorporate market entry and exit of firms, including Böckerman and Maliranta (2007), Diewert and Fox (2010), Hyytinen and Maliranta (2013), Holm (2014), and Maliranta and Määttänen (2015).

In the conventional Schumpeterian interpretation, market entry corresponds to the creation of new firms, and market exit reflects the liquidation of unsuccessful producers (Schumpeter, 1942; Jovanovic, 1982). Recent studies by Kuosmanen and Kuosmanen (2021, 2024) show that market entry and exit can also occur as a result of industry switching: some exiting firms do not close down but continue to operate in another industry, while some entering firms are not genuinely new firms but have previously operated in another industry.[1] To better understand the nature of market entry and exit, we investigate the extent to which observed entry and exit occur through mergers and acquisitions (M&A), spin-offs, and other forms of corporate restructuring, and how these restructuring events contribute to aggregate productivity growth.

In recent decades, increasing market concentration and market power have had significant productivity effects with macroeconomic implications De Loecker and Eeckhout (2018); De Loecker et al. (2020); Syverson (2011). This motivates us to examine the productivity contributions of M&As and restructuring at a more granular level. Distinguishing genuine firm churning from restructuring-related changes presents an important measurement challenge in administrative longitudinal data. Firm identifiers may change for legal, organizational, or ownership-related reasons, creating the appearance of entry and exit even when the underlying economic activity continues. As a result, conventional productivity decompositions that classify firms simply as continuing, entering, or exiting based on observed firm identifiers may misinterpret restructuring events as creative destruction. This issue has become increasingly relevant in recent decades, as M&A activities and other types of corporate restructuring have become central features of industrial dynamics.

This study examines how mergers, acquisitions, and other corporate restructuring events contribute to measured productivity dynamics. Using linked administrative data covering all Finnish manufacturing employees and their employing firms during 2010–2022,

[1] A well-known example from the mobile phone market is the introduction of the iPhone by Apple in 2007, which eventually led to the exit of Nokia from the mobile phone market. Nokia was the world's largest mobile phone manufacturer for 14 consecutive years between 1998 and 2012. Apple was not a new firm in 2007, and Nokia did not close down, but continued to operate in other markets.

we exploit worker-flow information to distinguish genuine market entry and exit from restructuring-related events. By observing worker-cluster transitions between firms, it becomes possible to identify cases in which production units continue under new organizational structures, such as mergers, spin-offs, or phoenix firms. This approach allows us to construct a more granular classification of firm dynamics that separates continuing firms, M&A acquirers, genuine entries and exits, and restructuring-related entries and exits. While the main analysis focuses on the manufacturing sector, as a robustness check, we also examine whether the private service industries exhibit similar patterns.

This study makes three main contributions. First, we assemble a unique administrative dataset that combines firm-level financial statement information with FOLK records encompassing all individuals, employees, and their employers. This dataset allows us to track worker flows between firms and identify restructuring events that would otherwise appear as entries or exits in conventional firm-level panels. Second, we incorporate mergers, acquisitions, and restructuring activities into a structural productivity decomposition framework. Specifically, we apply the structural change decomposition developed by Kuosmanen and Kuosmanen (2021, 2024), which guarantees the consistent aggregation of firm-level productivity measures at the industry level. Third, we provide new empirical evidence on the role of restructuring and M&A in productivity dynamics. In particular, we show that firms involved in restructuring exhibit substantially higher productivity levels than genuinely entering or exiting firms, yet the contribution of restructuring-related turnover to aggregate productivity growth remains smaller than that of genuine market entry and exit.

Our empirical results reveal several important findings. First, a substantial share of apparent firm entry and exit in Finnish manufacturing reflects corporate restructuring rather than genuine market turnover. Second, firms that exit through restructuring exhibit significantly higher labor productivity than those that exit through liquidation. Similarly, restructuring entrants, such as spin-offs and phoenix firms, have higher initial productivity levels than genuinely newly established firms. Third, despite these higher productivity levels, genuine entry and exit associated with Schumpeterian creative destruction make a larger positive contribution to aggregate productivity growth. Fourth, we find that continuing firms that undertake acquisitions or mergers exhibit a distinctive productivity trajectory characterized by a sharp decline in labor productivity around the restructuring event, followed by gradual recovery. Finally, the within-group reallocation component of the decomposition plays a major role in short-run fluctuations of aggregate productivity, reflecting productivity shocks affecting a small number of large firms.

Taken together, these findings highlight the importance of distinguishing between genuine market turnover and restructuring-related firm dynamics when analyzing productivity growth. Ignoring restructuring events may lead to misleading conclusions regarding the mechanisms underlying structural change and productivity dynamics.

The remainder of this paper proceeds as follows. Section 2 describes the data, sample construction, and worker-flow methodology used to identify mergers, acquisitions, and other restructuring events. Section 3 presents the productivity decomposition framework. Section 4 provides descriptive evidence on productivity dynamics around acquisitions and restructuring events. Section 5 presents the decomposition results and robustness analyses. Section 6 concludes.

2 Data sources, sample construction and definitions

2.1 Data and firm-to-firm worker-cluster transitions

Our analysis is based on matched administrative microdata from Statistics Finland covering the period 2010–2022. The core dataset is the annual firm-level financial statements panel, which provides information on variables such as value added, balance sheet variables, industry classification (NACE Rev. 2), and full-time equivalent employment. These firm accounts are linked to longitudinal FOLK records, encompassing detailed data on all Finnish residents, their employment status, and employing firm identifiers. This enables us to track individual workers across firms over time and construct detailed worker-flow measures between predecessor and successor firms. Finally, the Finnish Business Register provides establishment and termination dates as well as ownership information. These independent data are used to validate the timing of firm entry and exit based on worker-flow classification.

Firm identifiers are harmonized across data sources to ensure a consistent firm-level identifier throughout the panel. We focus on manufacturing firms, as defined by the NACE Rev. 2 classification. After linking administrative sources, we impose sample restrictions to obtain a consistent longitudinal panel suitable for structural change decomposition. First, we restrict our attention to privately owned firms, as identified by ownership indicators available in the business register. Second, we remove firms that are observed only once in the panel because they do not contribute to intertemporal productivity comparisons. Third, we exclude firms with gaps in annual observations to avoid mechanically generating spurious entry and exit patterns from missing years. Fourth, we exclude micro firms by requiring that maximum full-time equivalent employment exceeds five during the observation period. Finally, to limit the influence of extreme observations, labor productivity is winsorized at the 1st and 99th percentiles of the pooled firm-level distribution.

A central component of the panel construction is the identification of restructuring events using firm-to-firm worker-cluster transitions constructed from the matched employer-employee data. In this paper, for simplicity, we define mergers, acquisitions, takeovers, spin-offs, phoenix firms, and firm ID changes collectively as firm restructuring.

Information on individuals' employment status and employing firms is measured on December 31 of each record year. Therefore, in the analysis, we focus on firm-to-firm worker transitions that occur within a calendar year, ensuring that workers do not first move into non-employment and subsequently find work together in another firm. Most transitions are singletons, where one employee moves from one firm to another (70.2 percent for firms in manufacturing). Following Benedetto et al. (2007), we set a minimum absolute magnitude for the flows between firms. Specifically, we only consider worker-cluster transitions involving at least five workers, as such movements are more likely to reflect firm-level decisions of an important economic event rather than the normal single-worker dynamics of the labor market.

For each firm-year, we compute the share of employees who move from firm A (predecessor) to firm B (successor) in the subsequent year. Following Benedetto et al. (2007), Figures 1 and 2 present the frequency distributions of outflow and inflow shares, respectively. Figure 1 shows a U-shaped frequency distribution of outflow shares, with a visible increase in relative frequency around the 0.75 threshold. Based on the observed distribution, we adopt 75 percent as the baseline threshold. Symmetrically, we apply the same 75 percent threshold to inflows to the successor firm, as shown in Figures 2. In what follows, a predecessor-successor relationship is defined when (i) at least five workers move and (ii) at least 75 percent of the predecessor firm's workforce transfers to a single successor firm. We also consider cases where at least 75 percent of the successor firm's workforce originates from a single predecessor firm. Benedetto et al. (2007) motivate an 80 percent threshold as a natural cutoff for a significant outflow rate in U.S. data, while Hethey-Maier and Schmieder (2013) propose a similar threshold using German data. We consider an alternative threshold of 60 percent as a robustness check.

An advantage of our analysis is the availability of detailed records on firm establishment and termination dates, although termination dates often contain more missing values than establishments for structural and administrative reasons. When a firm is created, it typically must register with authorities, and this mandatory registration generates a clear establishment date in the administrative data. In contrast, firm closures often do not require a single formal termination action, meaning that the exact closing date may never be recorded; firms may simply cease operations without formally deregistering.

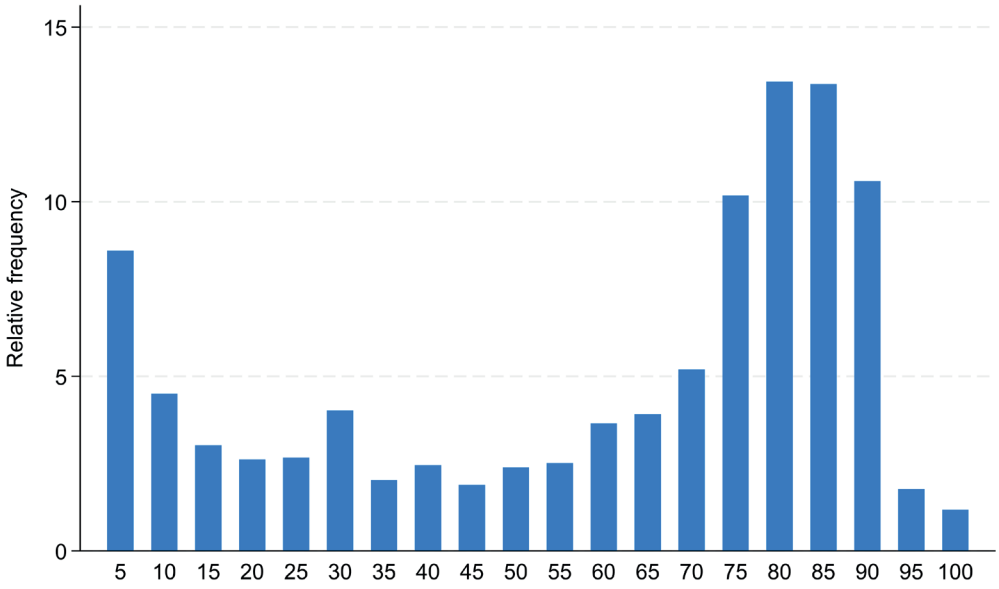

Figure 1: Frequency distribution of outflow shares from predecessor firms.

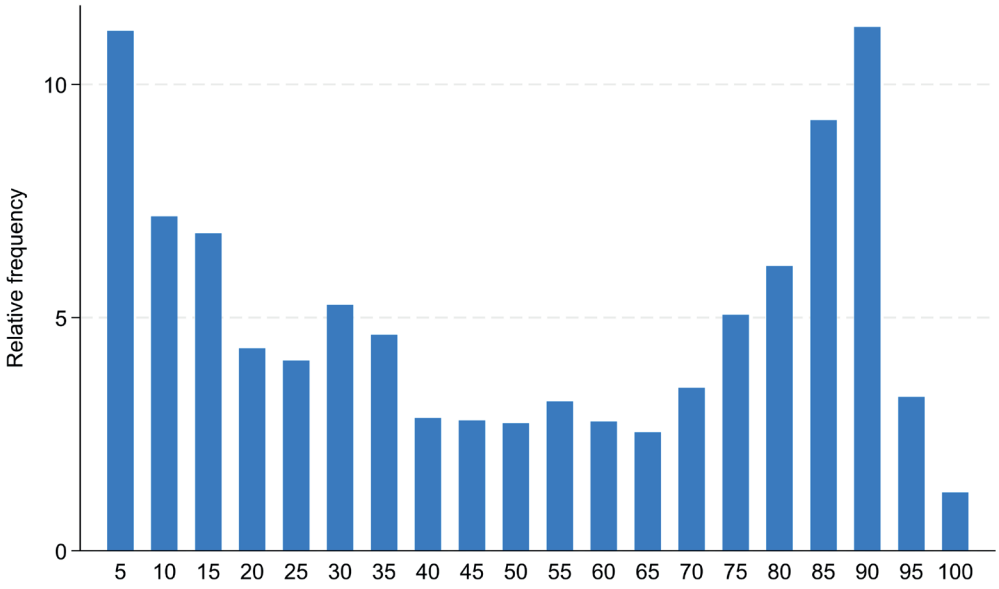

Figure 2: Frequency distribution of inflow shares to successor firms.

These worker-flow indicators, together with detailed records on establishment and termination dates, allow us to distinguish genuine market entry and exit from restructuring-related transitions, such as mergers, acquisitions, spin-offs, and phoenix-type reorganizations. We also construct a variable identifying acquisitions, defined as continuing firms that absorb other firms over time. To reduce the misclassification of entries, we exclude potentially misclassified entries, defined as firms whose first observed year in the financial

panel deviates from the recorded establishment year by at least three years. This adjustment is important because firms may obtain a business entity code before the actual operation begins. However, the number of firms in this category is modest, only 89 firms, representing 521 firm-year observations during the 2010–2022 period, which further validates the overall quality of the recorded establishment dates. The final sample contains 9,110 firms and 111,807 firm-year observations over the period 2010–2022.

2.2 Classifying firm groups

Conventional productivity decompositions classify firms into three groups: continuing firms, exiting firms, and entering firms. A key measurement challenge is that entering firms are unobserved in the base year and exiting firms are unobserved in the target year, which complicates the interpretation of entry and exit contributions to aggregate productivity change. An additional challenge in administrative longitudinal data is that firm identifiers can change for legal, organizational, or ownership-related reasons, so that apparent entry and exit may partly reflect corporate restructuring rather than genuine market turnover. Previous research on worker flows shows that worker-cluster transitions between firms can be used to distinguish genuine economic events from spurious identifier changes and firm restructuring (Benedetto et al., 2007; Hethey-Maier and Schmieder, 2013).

This study focuses on the productivity implications of M&A and related restructuring by extending the conventional three-way classification into six mutually exclusive subgroups. Continuing firms are categorized into (i) continuing firms with no M&A activity during the period and (ii) continuing firms that acquire another firm during the period ("M&A acquirers"). Entering firms are categorized into (iii) genuine entries and (iv) restructuring entries. Finally, exiting firms are categorized into (v) genuine exits and (vi) restructuring exits. Note that a restructuring event is identified when at least five workers move as a cluster and the transition constitutes either an inflow or outflow rate of at least 75 percent between the predecessor and successor firm. The resulting classification is defined as follows:

- **Continuing firm (with no M&A):** A firm is present in both periods, and fewer than 75 percent of its workforce originates from any single predecessor firm. Likewise, fewer than 75 percent of workers from any single predecessor firm transition to the continuing firm. This pattern reflects normal worker mobility rather than restructuring.
- **Continuing firm (M&A acquirers):** A firm is present in both periods and receives at least 75 percent of the workforce of a predecessor firm, or at least 75 percent of its workforce originates from a single predecessor firm during the transi-

tion period. This pattern reflects a restructuring event rather than ordinary worker mobility.

- **Genuine entry:** A firm is not observed in the first period but appears with a new firm identifier in the second period. The firm is formed by a newly assembled workforce, rather than through restructuring. Specifically, less than 75 percent of the firm's workforce originates from any single predecessor firm, and less than 75 percent of any predecessor firm's workforce moves to the new firm.
- **Restructuring entry:** A firm is not observed in the first period but appears with a new firm identifier in the second period. The firm is created through restructuring. Specifically, at least 75 percent of the firm's workforce originates from a single predecessor firm, or at least 75 percent of a predecessor firm's workforce moves to the new firm.
- **Genuine exit:** A firm is observed in the first period, but not in the second period. Less than 75 percent of its workforce moves to any single successor firm within the two years preceding its exit.
- **Restructuring exit:** A firm is observed in the first period, but not in the second period. At least 75 percent of its workforce moves to a single successor firm within the two years preceding its exit.

This classification separates genuine market entry and exit from ownership- or organizatic related restructuring and distinguishes stable incumbents from firms that expand through acquisitions.

3 Productivity decomposition

This section presents the framework used to decompose aggregate labor productivity into contributions from different groups of firms. The analysis builds on the structural change decomposition developed by Kuosmanen and Kuosmanen (2021, 2024), which extends the well-known Olley-Pakes decomposition by ensuring consistent aggregation of firm-level productivity measures at the industry level and allowing the decomposition to be applied to both productivity levels and productivity growth.

Labor productivity of firm i in period t is defined as the ratio of value added (y_{it}) and labor input (l_{it}), formally,[2]

$$p_{it} = \frac{y_{it}}{l_{it}}, \qquad i = 1, \ldots, N_t;\ t = 1, \ldots, T. \tag{1}$$

[2]The proposed decomposition is directly applicable to other productivity measures such as total factor productivity (TFP), or partial productivity measures such as energy productivity or carbon productivity.

The aggregate of all N_t firms operating in period t is referred to as an industry or a sector. Note that N_t can change over time due to market entry and exit. Aggregate labor productivity of the industry in period t is given by

$$P_t = \frac{Y_t}{L_t} = \frac{\sum_{i=1}^{N_t} y_{it}}{\sum_{i=1}^{N_t} l_{it}} \tag{2}$$

where Y_t is the total value added of the industry in period t, and L_t is the total labor input of the industry.

To link the firm-level and the industry-level, it is helpful to restate labor productivity of the industry as a share-weighted average of firm-level productivity measures, formally,

$$P_t = \sum_{i=1}^{N_t} \frac{y_{it}}{l_{it}} \frac{l_{it}}{L_t} = \sum_{i=1}^{N_t} s_{it} p_{it}, \tag{3}$$

where $s_{it} = \frac{l_{it}}{L_t}$ is the employment share of firm i in year t. Note that the use of employment shares guarantees consistent aggregation of firm-level labor productivity indicators to the industry level (see also Blackorby and Russell, 1999 on the aggregation of productivity indices).[3]

3.1 Static productivity decomposition

Our objective is to measure the contributions of market entry, exit, mergers, acquisitions, and other forms of restructuring to the level and change of productivity of a specific one- or two-digit industry division (denoted by D) over a chosen study period $[t, t+k]$, where t denotes the base period and $t+k$ is the target period. It is important to note that the length of the study period can affect the results; as the study period becomes longer, the relative share of continuing firms without M&A activities will decrease. Consequently, the contribution of structural change may appear insignificant in a one-year period but may become more prominent over a longer period of four or six years, as seen in previous studies such as (Holm, 2014) and (Kuosmanen and Kuosmanen, 2021, 2024).

Recall that the total number of firms in the industry division D in period t is N_t. Given the complete data of all firms operating in the base period t and the target period $t+k$, we identify the following mutually exclusive subsets of firms in period t, as discussed in the previous section:

$C(t) = \{$continuing firms in period t, with no M&A activities between t and $t+k\}$,

$CM(t) = \{$continuing firms in period t, with at least one M&A acquisition between t and $t+k\}$,

[3] It is not self-evident that firm-level productivity measures can be consistently aggregated to industry-level (Kuosmanen and Kuosmanen, 2021). Clearly, if consistent aggregation is possible, then industry-level productivity must be a share weighted average of the firm-level productivity measures.

$ExR(t) = \{$firms in period t, which exit by $t+k$ through M&A acquisition or firm restructuring$\}$,

$ExG(t) = \{$firms in period t, which genuinely close down by $t+k\}$.

We henceforth refer to these four groups as continuing firms with no M&A activities ($C(t)$), continuing M&A acquirers ($CM(t)$), restructuring exits ($ExR(t)$), and genuine exits ($ExG(t)$). Note that the first two groups continue to operate in the target period $t+k$, whereas the last two groups no longer exist in period $t+k$.

From the perspective of target period $t+k$, we can similarly form the following mutually exclusive subsets

$C(t+k) = \{$continuing firms in period $t+k$, with no M&A activities between t and $t+k\}$,

$CM(t+k) = \{$continuing firms in period $t+k$, with at least one M&A acquisition between t and $t+k\}$,

$EnR(t+k) = \{$firms in period $t+k$, which entered after period t through firm restructuring$\}$,

$EnG(t+k) = \{$firms in period $t+k$, which genuinely entered after t without a prior history$\}$.

Note that the first two groups operated in the base period t, whereas the last two groups did not yet exist in period t. We will henceforth refer to the last two groups as restructuring entrants ($EnR(t+k)$), and genuine entrants ($EnG(t+k)$).

Industry division D is defined by the following set

$$D(t) = \{\text{all firms in industry } D \text{ in period } t\}.$$

Starting from the core group of continuing firms unaffected by firm restructuring, and adding further layers of structural change, we introduce the following nested structures. In the base period, we have

$$\begin{aligned} C(t) &\subseteq C(t) \cup CM(t) \\ &\subseteq C(t) \cup CM(t) \cup ExR(t) \\ &\subseteq C(t) \cup CM(t) \cup ExR(t) \cup ExG(t) = D(t). \end{aligned}$$

In the target period $t+k$, we have similarly

$$\begin{aligned} C(t+k) &\subseteq C(t+k) \cup CM(t+k) \\ &\subseteq C(t+k) \cup CM(t+k) \cup EnR(t+k) \\ &\subseteq C(t+k) \cup CM(t+k) \cup EnR(t+k) \cup EnG(t+k) = D(t+k). \end{aligned}$$

The specific ordering of these nested subsets is motivated by the following observations. First, subgroups C and CM both consist of continuing firms that operate throughout $[t, t+k]$, however, the latter group CM represents an interesting but largely neglected form of structural change. The third groups ExR and EnR, both capture quasi-continuous production activities subject to firm restructuring. In contrast, the fourth layers, ExG and EnG, capture genuine exit and entry in the classic interpretation of creative destruction. In summary, the subgroups are ranked from the most stable to the least stable corporate structure observed during the period $[t, t+k]$.

Following Kuosmanen and Kuosmanen (2021, 2024), we next utilize this nested structure to measure the contributions of structural change to the level of labor productivity in periods t and $t+k$.

First, we measure the contribution of M&A activities using the following differences in the sub-sample averages

$$M(t) = \bar{p}_{C(t) \cup CM(t)} - \bar{p}_{C(t)}, \tag{4a}$$

$$M(t+k) = \bar{p}_{C(t+k) \cup CM(t+k)} - \bar{p}_{C(t+k)}. \tag{4b}$$

where the subscripts indicate the relevant subset of firms and the time period. The rationale for using unweighted subsample means is similar to that of Olley and Pakes (1996) decomposition. The differences in the average productivity of all continuing firms and those without M&A activity capture the incremental contribution of M&A acquisition. Note that equation (4a) reflects the selection effect before the M&A acquisition has taken place, whereas equation (4b) captures the productivity difference after the M&A acquisition.

Next, the contributions of restructuring exit and entry are measured using the following differences in the sub-sample averages

$$ExR(t) = \bar{p}_{C(t) \cup CM(t) \cup ExR(t)} - \bar{p}_{C(t) \cup CM(t)}, \tag{5a}$$

$$EnR(t+k) = \bar{p}_{C(t+k) \cup CM(t+k) \cup EnR(t+k)} - \bar{p}_{C(t+k) \cup CM(t+k)}. \tag{5b}$$

The rationale is directly analogous to that of Equations (4a) and (4b). The difference between the subsets in difference (5a) only concerns the exiting firms subject to M&A acquisition or other types of firm restructuring, which nominally disappear by period

$t+k$, but continue production activities under some other corporate label. Similarly, the difference between the subsets in (5b) concerns newly created firms associated with restructuring, including spinoff and phoenix firms, which continue their previous activities under a new label.

Similarly, the contributions of genuine entry and exit are measured by the following residual terms

$$ExG(t) = \bar{p}_{D(t)} - \bar{p}_{C(t) \cup CM(t) \cup ExR(t)}, \tag{6a}$$

$$EnG(t+k) = \bar{p}_{D(t+k)} - \bar{p}_{C(t+k) \cup CM(t+k) \cup EnR(t+k)}. \tag{6b}$$

The difference between the subsets in (6a) concerns those firms observed in period t, which will close down completely by period $t+k$. Similarly, the difference between the subsets in (6b) reflects genuinely new firms without prior history, which entered division D between periods t and $t+k$.

Finally, we introduce the within-groups allocation terms as

$$WGA(t) = P_t - \bar{p}_{D(t)}, \tag{7a}$$

$$WGA(t+k) = P_{t+k} - \bar{p}_{D(t+k)}. \tag{7b}$$

The difference between the aggregate productivity of the industry division and the average productivity of all firms reflects the allocation of labor across firms. Intuitively, if large firms are more productive than small firms, then the differences (7a) and (7b) are positive. Note that these WGA terms are directly equivalent to the Olley and Pakes (1996) covariance term (see Kuosmanen and Kuosmanen, 2021, 2024 for a more detailed discussion of this point).

The following proposition shows that the components introduced above add up exactly to productivity at the industry level.

Proposition 1. The productivity of industry D in periods t and $t+k$ is obtained as the sum of the following components:

$$P_t = \bar{p}_{C(t)} + M(t) + ExR(t) + ExG(t) + ALL(t), \tag{8a}$$

$$P_{t+k} = \bar{p}_{C(t+k)} + M(t+k) + EnR(t+k) + EnG(t+k) + ALL(t+k). \tag{8b}$$

Our static decomposition has an additive structure that reflects the nested structure of the subsets and the fact that an industry division is defined as the sum of its firms. A similar additive structure is also present in the Olley and Pakes (1996) formulation. The static decomposition of the base period productivity in t makes use of the information about future mergers and exits by period $t+k$. In contrast, the static decomposition of the target period's productivity in $t+k$ captures firms that had M&A acquisitions or

entered the industry since period t. Exact aggregation consistent static decomposition is useful as such, but it also provides a strong foundation for decomposing productivity changes over time.

3.2 Intertemporal productivity decomposition

The main interest in productivity decompositions concerns their ability to shed light on the underlying sources of productivity growth. Having developed an aggregation-consistent static decomposition of the productivity levels in the base period and the target period, we next extend it to the intertemporal decomposition of productivity change as follows:

Proposition 2. The productivity change of industry D from period t to period $t+k$ can be decomposed as:

$$\Delta P = \Delta \bar{p}_C + \Delta M + \Delta RE + \Delta GE + \Delta ALL. \tag{9}$$

where

$\Delta P = \dfrac{P_{t+k}}{P_t}$ (aggregate productivity change),

$\Delta \bar{p}_C = \dfrac{\bar{p}_{C(t+k)}}{\bar{p}_{C(t)}}$ (contribution of continuing firms without M&A),

$\Delta M = \dfrac{\bar{p}_{C(t+k)\cup CM(t+k)}}{\bar{p}_{C(t)\cup CM(t)}} - \dfrac{\bar{p}_{C(t+k)}}{\bar{p}_{C(t)}}$ (contribution of M&A acquisitions),

$\Delta RE = \dfrac{\bar{p}_{C(t+k)\cup CM(t+k)\cup EnR(t+k)}}{\bar{p}_{C(t)\cup CM(t)\cup ExR(t)}} - \dfrac{\bar{p}_{C(t+k)\cup CM(t+k)}}{\bar{p}_{C(t)\cup CM(t)}}$ (contribution of restructuring entry and exit),

$\Delta GE = \dfrac{\bar{p}_{D(t+k)}}{\bar{p}_{D(t)}} - \dfrac{\bar{p}_{C(t+k)\cup CM(t+k)\cup EnR(t+k)}}{\bar{p}_{C(t)\cup CM(t)\cup ExR(t)}}$ (contribution of genuine entry and exit),

$\Delta ALL = \dfrac{P_{t+k}}{P_t} - \dfrac{\bar{p}_{D(t+k)}}{\bar{p}_{D(t)}}$ (contribution of reallocation).

The first component on the right-hand side of decomposition (9) captures the productivity change of firms that continue to operate without M&A activities. This is the core subset of firms not directly affected by structural change. Productivity change in the subset C can be interpreted as a counterfactual scenario of how aggregate productivity might have developed in the absence of structural changes.

The second item ΔM captures the incremental contribution of M&A acquiring firms. Note that the union of subsets C and CM takes into account the relative sizes of these subgroups. If the observed productivity change in the subgroup C provides a credible

counterfactual for the productivity change in the subgroup CM in the absence of M&A acquisitions, then component ΔM can be seen as a causal effect of M&A acquisitions. However, one must be extremely cautious with such causal claims. Obviously, M&A acquisitions are not randomly distributed across continuing firms, but are strategic choices of firm management. There can be various types of selection effects between subsets C and CM.

Further, we do not know whether any observed productivity effects are due to the acquisition itself or to the selection of firms that become M&A acquirers. In essence, the causal interpretation of the M&A acquisition effect depends on whether or not the observed productivity trajectory of the subset C provides a credible counterfactual for the productivity development in the subset CM in the absence of M&A acquisitions or not. However, even if there are valid reasons to question the causal interpretation, in practice, a comparison of productivity development in the subgroups C and CM is likely the best way to shed empirical light on the likely productivity contribution of M&A acquisitions.

The third component ΔRE captures the incremental contribution of restructuring entrants over the restructuring exits to aggregate productivity change. Note that intertemporal net contribution of restructuring entry and exit fundamentally depends on the magnitudes of the static restructuring entry and exit effects relative to the average productivity change of the continuing firms: ΔRE can be equivalently stated using the static components as

$$\Delta RE = \frac{EnR(t+k) + \bar{p}_{C(t+k)\cup CM(t+k)}}{ExR(t) + \bar{p}_{C(t)\cup CM(t)}} - \frac{\bar{p}_{C(t+k)\cup CM(t+k)}}{\bar{p}_{C(t)\cup CM(t)}}. \tag{10}$$

Equation (10) helps to elaborate the connection between the static restructuring entry and exit components (5a) and (5b) and their net contribution ΔRE in the intertemporal productivity decomposition. Note that ΔRE measures the contributions of restructuring entry and exit relative to the productivity change of the continuing firms in subgroups C and CM. Since the entering firms did not exist in period t and the exiting firms no longer exist in period $t+k$, such intertemporal notions as "change in entry" or "change in exit" are completely void of meaning in the present setting. Instead of trying to forcefully separate entry and exit from ΔENX, one can always complement the intertemporal decomposition by reporting additional information from the static contributions of market entry $ENT(t+k)$ and market exit $EXT(t)$.

Analogously, the fourth component ΔGE measures the incremental contribution of genuine entrants over the genuine exits. Note that the subgroups of genuine entry and exit are obtained as the intersection of all firms D and the three subsets added in the previous step. The intertemporal net contribution of genuine entry and exit depends on the magnitudes of the static genuine entry and exit effects relative to the average productivity change of the continuing firms and restructuring entry and exit. We stress that the order

in which these subgroups are added as nested subgroups to form the industry division D can influence the results. The intertemporal decomposition is inherently conditional on the ordering of nested firm subsets used to construct the industry aggregate. As shown by Bruhn et al. (Bruhn et al., 2023), alternative orderings may redistribute contributions across entry, exit, and reallocation components even when aggregate productivity change is unchanged.

In this study, we deliberately introduce genuine entry and exit as the final component in the nesting order, because these firms represent the most extreme form of Schumpeterian creative destruction. Our argument for leaving the genuine entry and exit as the last subcomponent is based on the fact that these firms represent the most extreme form of Schumpeterian creative destruction. This ordering ensures that all quasi continuous production activities associated with mergers, acquisitions, and restructuring are accounted for prior to measuring the residual contribution of genuine market turnover. As a result, the reported contribution of genuine entry and exit should be interpreted relative to this economically motivated decomposition structure, rather than as an invariant structural parameter.

The last item ΔALL measures the change in the static Olley-Pakes allocation component over time. It is worth stressing that a large positive (negative) value of ΔALL in the context of labor productivity does not necessarily imply that a number of employees have switched jobs to more (less) productive firms. Even in the complete absence of labor mobility, the absolute value of ΔALL can be large if productivity growth rates differ between small firms and large firms (in terms of the number of employees).

The key contribution of the proposed decompositions presented above beyond the previous works by Kuosmanen and Kuosmanen (2021, 2024) concerns, on the one hand, the distinction between continuing firms that are M&A acquirers and non-acquirers and, on the other hand, the distinction between the restructuring entry and exit from the genuine entry and exit. The basic logic of the static and intertemporal decompositions based on nested subsets of firms is exactly the same. In this study, the key challenge was to organize four mutually exclusive subsets of firms into a series of nested subsets. In our view, the proposed ordering of subsets from the most stable to the most fluid subsets of firms provides the most natural way to quantify the contributions of structural change on aggregate productivity. The present study further demonstrates that the nested subsets approach to decomposing the level and change of aggregate productivity is applicable in various different settings of interest.

4 Descriptive analysis of M&A and restructuring events

To provide an initial descriptive overview of productivity dynamics around M&A and restructuring events, we examine the evolution of labor productivity in the relevant subgroups of firms using event study plots. Labor productivity is measured as real value added per full-time equivalent employee (FTE). Value added is expressed in constant prices using the Finnish GDP price deflator (2015 = 100). These figures illustrate how labor productivity develops before and after key firm events and provide useful stylized facts that help interpret the decomposition results presented later in this study.

Within the full dataset, we identify 216 acquisition events undertaken by 210 acquiring firms using worker-flow-based restructuring indicators, indicating that a small number of firms undertake multiple acquisitions during the sample period. Figure 3 presents an event study plot of labor productivity for the subgroup of continuing firms that undertake an acquisition. The figure tracks the average labor productivity of these firms beginning three years prior to the acquisition and continuing up to five years after the acquisition. While event study plots are often used in quasi-experimental settings to demonstrate causal treatment effects, it is important to emphasize that M&A are endogenous strategic decisions made by firms. Consequently, the patterns shown in Figure 3 should not be interpreted as causal effects of acquisitions. Rather, the figure provides a descriptive illustration of how productivity typically evolves around acquisition events.

The event study is constructed by aligning firm-level productivity observations relative to the year of acquisition. In this case, year 0 denotes the year in which the acquisition occurs. Event year 0 should not be confused with a specific calendar year because acquisitions occur in different calendar years for different firms in the sample. To ensure that productivity trajectories can be observed both before and after the acquisition, we require that each firm has at least three years of observations prior to the acquisition and five years of observations after the acquisition within the overall sample period of 2010–2022. Consequently, Figure 3 includes only acquisitions that occurred between 2013 and 2017, allowing a full event window to be observed. After imposing this balanced event-window requirement, the event-study sample consists of 75 acquiring firms observed over nine event-time periods (-3 to $+5$). These firms represent the subset of acquiring firms for which the full event window can be observed within the 2010–2022 sample period.

Figure 3 reveals a clear pattern in the evolution of labor productivity around acquisition events. In particular, labor productivity typically drops sharply (on average, by 29 percent) in the acquisition year. This decline likely reflects the immediate integration of the acquired firm, which may increase employment and incorporate production units with different productivity levels into the acquiring firm's organizational structure. Following the acquisition year, labor productivity gradually recovers over time. However, even five

years after the acquisition, the average productivity of the acquiring firms remains below its pre-acquisition level.

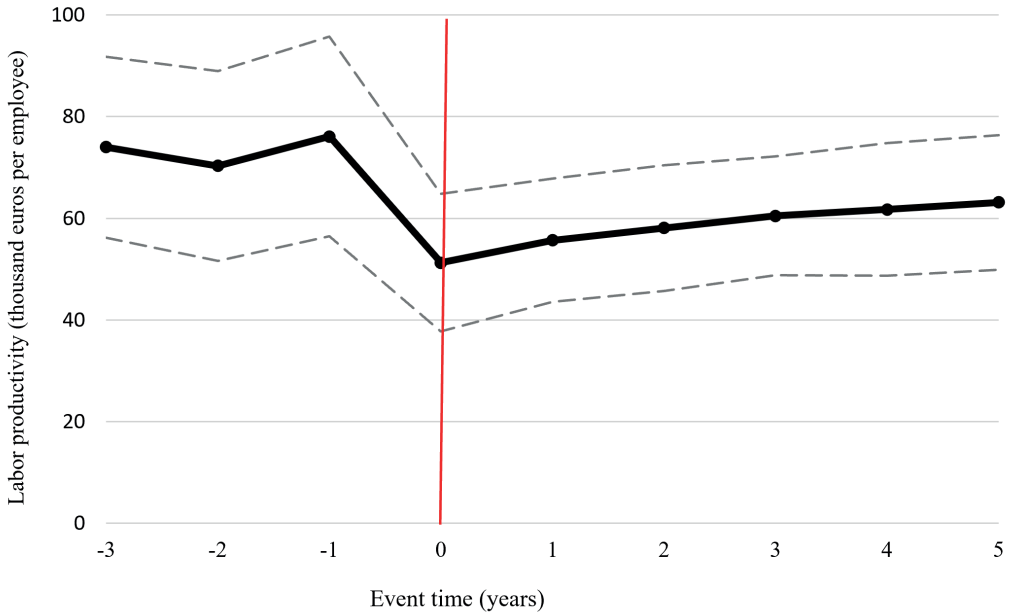

Figure 3: Labor productivity trajectories around acquisitions.

Notes: The figure reports average labor productivity from three years before to five years after an acquisition for firms undertaking an acquisition ($n = 75$). Event year 0 denotes the acquisition year. Grey broken lines indicate 95 percent confidence intervals. Only acquisitions occurring between 2013 and 2017 are included to ensure at least three pre-acquisition and five post-acquisition observations within the 2010–2022 sample period.

Figure 4 presents analogous event study plots for firms that have exited the market. Because firms cease to exist after exit, labor productivity can only be observed in the years leading up to the exit event. Accordingly, the figure reports labor productivity trends during the five years preceding exit year 0. Importantly, Figure 4 distinguishes between two types of exits identified using worker flows: genuine exits associated with liquidation and restructuring exits associated with mergers, acquisitions, or other forms of corporate restructuring. The full dataset includes 1,529 genuine exits and 465 restructuring exits. After imposing the balanced event-window requirement, the event-study sample consists of 854 genuine exits and 246 restructuring exits.

The figure shows that the productivity trajectories of these two subgroups differ markedly. Firms classified as genuine exits (broken line) exhibit a clear downward trend in labor productivity in the years preceding exits, consistent with the idea that declining performance often precedes firm liquidation. In contrast, firms classified as restructuring exits (solid line) show a slightly increasing productivity trend prior to exit. Moreover, the level of labor productivity is systematically higher for restructuring exits than for genuine exits throughout the observed period. The difference between these two subgroups

is highly statistically significant. These patterns suggest that restructuring exits fundamentally differ from genuine market exits. Rather than reflecting failing firms leaving the market, restructuring exits appear to involve relatively productive firms whose activities continue within another organizational structure.

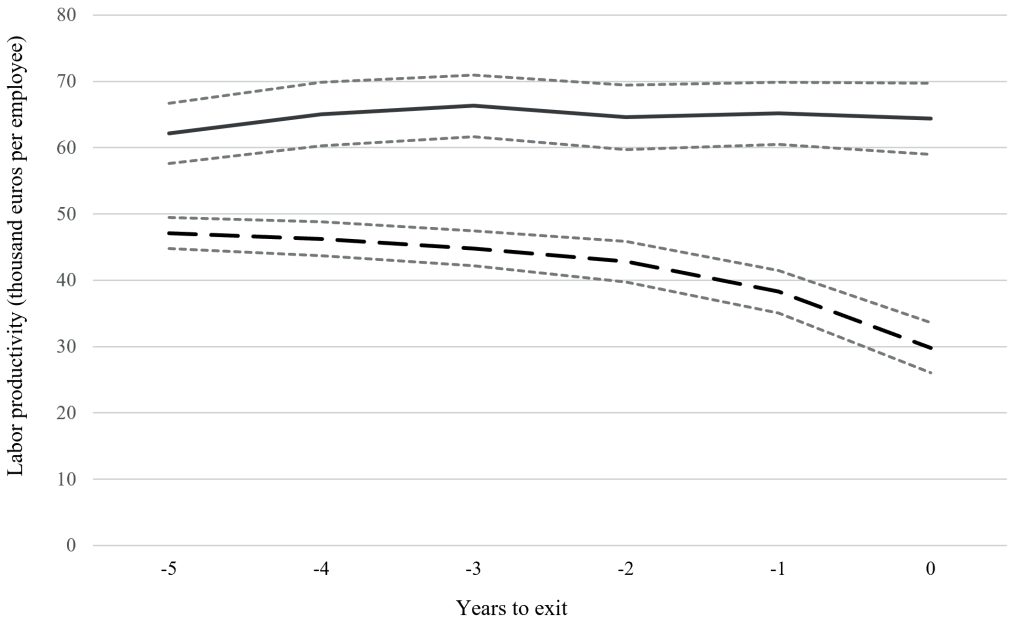

Figure 4: Labor productivity trajectories during the five years preceding market exit: genuine exits and restructuring exits.

Notes: The figure shows average labor productivity during the five years preceding market exit for firms classified as genuine exits (broken line, $n = 854$) and restructuring exits (solid line, $n = 246$). Grey broken lines indicate 95 percent confidence intervals.

Figure 5 presents similar event study plots for entering firms. As firms are not observed prior to entry, labor productivity can only be measured starting from the year in which the firm first appears in the data. The figure, therefore, reports labor productivity developments during the first five years following entry year 0. As in the previous analysis, we distinguish between genuine entries and restructuring entries (such as spin-offs) identified using worker-flow information. The sample includes 1,610 genuine entries and 410 restructuring entries. After imposing the balanced event-window requirement, the event-study sample consists of 1,085 genuine entrants and 265 restructuring entrants.

The results reveal a clear productivity gap between the two groups. Firms classified as restructuring entries exhibit substantially higher labor productivity at entry than genuinely new firms entering the market. This difference is highly statistically significant and persists throughout the five-year observation window. However, the average productivity growth rate is notably higher in the subgroup of genuine entry. This means that genuine entrants are catching up with restructuring entrants, but the gap in levels

remains. These findings are consistent with the interpretation that restructuring entries represent organizational continuations of existing productive units, such as spin-offs or phoenix firms, whereas genuine entries represent newly established firms that typically start at lower productivity levels.

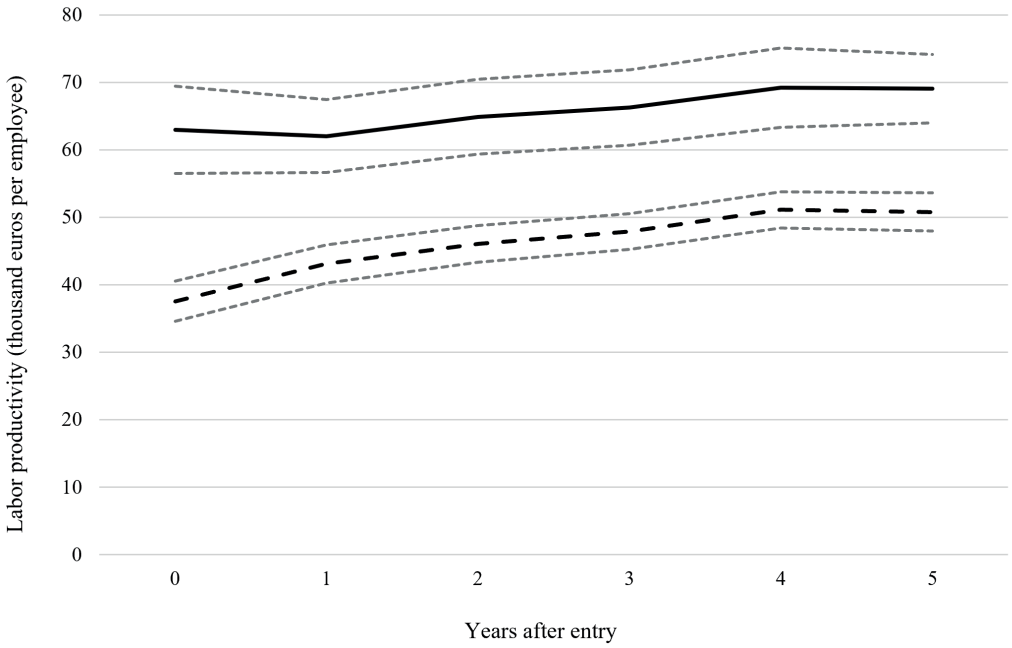

Figure 5: Labor productivity trajectories during the five years following market entry: genuine entries and restructuring entries.

Notes: The figure shows average labor productivity during the first five years following market entry (event year 0) for firms classified as genuine entries (broken line, $n = 1,085$) and restructuring entries (solid line, $n = 265$). Grey broken lines indicate 95 percent confidence intervals.

Although labor productivity prior to entry is unobservable, the initial level of labor productivity in the subgroup of restructuring entry is, on average, closely aligned with that of the restructuring exit group in Figure 4. Comparing the subgroup of genuine entry in Figure 5 with that of genuine exit in Figure 4, we see that the average level of labor productivity is initially higher in the subgroup of genuine entry than in the genuine exit that is replaced. Most importantly, the subgroup of genuine entry has a positive growth trajectory, in contrast to the declining productivity trend of the genuine exit group. While genuinely new firms exhibit some initial catch-up during the first year after entry, the average productivity gap between restructuring entrants and genuine entrants remains largely unchanged thereafter.

Taken together, the descriptive evidence highlights the important differences between genuine market turnover and restructuring-related firm dynamics. Firms involved in restructuring events tend to have systematically higher productivity levels than those entering or exiting the market through genuine creation or liquidation. At the same

time, acquisitions are associated with short-run declines in measured labor productivity among acquiring firms. These descriptive patterns motivate a more formal assessment of how different types of firm dynamics contribute to aggregate productivity growth. In the following section, we quantify these contributions using the structural decomposition framework introduced in Section 3.

5 Decomposition results

5.1 Average labor productivity levels by subgroup

As a starting point, it is useful to compare the average labor productivity across the six subgroups of firms defined in Section 2.2. To examine the productivity contributions of structural change, including mergers, acquisitions, and other forms of restructuring, we consider longer time horizons than a single calendar year. Accordingly, the twelve-year study period 2010–2022 is divided into two equally long subperiods: 2010–2016 and 2016–2022. Table 1 reports the average labor productivity levels, measured in thousand euros per full-time equivalent employee (k€/FTE), for each subgroup in the first and last years of the two subperiods. The rightmost columns in Table 1 present the corresponding employment shares of the subgroups. The bottom row reports the aggregate labor productivity for the entire manufacturing sector. Several observations are worth noting.

Table 1: Average labor productivity levels (k€/FTE) and employment shares by subgroup in the 2010–2016 and 2016–2022 subperiods.

	Labor productivity (k€/FTE)				Employment share (%)			
	2010	2016	2016	2022	2010	2016	2016	2022
Continuing (no M&A)	54.96	59.11	59.70	66.82	86.2	82.2	91.5	92.6
Continuing (M&A acquirers)	72.90	65.00	65.13	71.55	3.4	6.1	1.0	2.2
Restructuring exit	63.90		60.72		4.6		2.9	
Genuine exit	38.42		42.20		5.8		4.5	
Restructuring entry		63.47		71.77		6.6		1.8
Genuine entry		47.42		49.38		5.0		3.4
Manufacturing sector	74.10	76.70	76.58	90.48	100	100	100	100

First, it is important to note that the assignment of firms to subgroups changes between the two subperiods. The subgroup classification is constructed separately for each period. As a result, the average labor productivity of the continuing firms (both M&A acquirers and no M&A subgroups) in 2016 can differ in the second and third columns of Table 1. The aggregate productivity of the manufacturing sector in the bottom

row is unaffected by the subgroup classification. However, the aggregate figures reported for 2016 differ slightly because the decomposition periods are constructed separately and labor productivity is winsorized before the subgroup averages are calculated (see Section 2).

Second, among continuing firms, those engaged in acquisitions exhibit substantially higher labor productivity than continuing firms without M&A activity. However, the productivity dynamics of the two groups differ across the first subperiod. Labor productivity increases among continuing firms without M&A activity, whereas the average productivity of M&A acquirers declines between 2010 and 2016. The employment shares indicate that acquisitions affected a larger share of employees during the first subperiod than in the second. In 2016, approximately six percent of employees in the manufacturing sector worked in firms that had undertaken an acquisition.

Third, clear differences emerge when comparing the two exit subgroups. Firms classified as genuine exits exhibit substantially lower labor productivity than restructuring exits in both 2010 and 2016, which is consistent with the patterns observed in Figure 4. The employment shares of the two subgroups are quite similar in magnitude. In 2010, more than ten percent of employees in the manufacturing sector worked in firms that would exit the market by 2016. Roughly half of this employment was in firms classified as restructuring exits rather than genuine exits, indicating that a substantial part of the apparent exit reflects organizational restructuring rather than complete economic disappearance.

Fourth, similar differences are observed among the entering firms. The subgroup of restructuring entrants exhibits markedly higher labor productivity than genuine entrants in both 2016 and 2022. In 2016, roughly seven percent of employees in the manufacturing sector worked in firms that entered the market through corporate restructuring.

Finally, comparing the subgroup productivity levels with the aggregate productivity of the manufacturing sector reveals an important compositional feature of the data. The aggregate labor productivity exceeds the average productivity level of each subgroup. This outcome reflects the Olley–Pakes allocation component within subgroups. The fact that aggregate productivity exceeds subgroup averages suggests that a relatively small number of large manufacturing firms exhibit substantially higher productivity levels than the majority of smaller firms. This compositional feature should be kept in mind when interpreting structural change decompositions.

5.2 Static productivity decomposition

We next illustrate the static productivity decomposition introduced in Proposition 1 by decomposing the aggregate labor productivity of the manufacturing sector into subgroup contributions for the first two four-year subperiods 2010–2013 and 2013–2016. We note

that M&A activity and corporate restructuring were particularly intensive in the Finnish manufacturing industries during these subperiods. For the sake of brevity, we omit the last two sub-periods in this subsection, but we cover all subperiods when we proceed to the dynamic decomposition presented in the next subsection.

Table 2 reports the employment-weighted contributions of each subgroup, measured in thousand euros per full-time equivalent employee (k€/FTE), together with the Olley–Pakes-type within-groups allocation component.

Table 2: Static productivity decomposition of labor productivity levels in manufacturing, 2010–2013 and 2013–2016.

	Labor productivity (k€/FTE)			
	2010	2013	2013	2016
Continuing (no M&A)	53.98	56.35	56.72	58.63
+ Continuing (M&A acquirers)	7.81	-0.42	12.06	4.55
+ Restructuring exit	0.33		-0.27	
+ Genuine exit	-4.33		-5.17	
+ Restructuring entry		0.86		0.18
+ Genuine entry		-3.42		-3.43
= Weighted sum of subgroups	57.78	53.37	63.34	59.93
+ Within groups reallocation	16.45	16.17	6.17	16.81
= Manufacturing sector total	74.23	69.54	69.51	76.74

By far the largest contribution to aggregate productivity comes from the subgroup of continuing firms without M&A activity, reflecting the large employment share of this group. Table 2 also shows that the incremental contribution of M&A acquirers to productivity levels varies across the endpoints. In 2010, M&A acquirers add 7.81 k€ per employee relative to continuing non-acquirers, but by 2013, their incremental contribution is slightly negative (−0.42 k€). Restructuring-related exit has a small contribution in both base years (0.33 k€ in 2010 and −0.27 k€ in 2013), while genuine exit contributes more strongly negatively (−4.33 k€ in 2010 and −5.17 k€ in 2013). On the entry side, restructuring entry contributes a small positive amount in the target years (0.86 k€ in 2013 and 0.18 k€ in 2016), whereas genuine entry contributes negatively (−3.42 k€ in 2013 and −3.43 k€ in 2016). Taken together, the results indicate that genuine entry and exit make larger contributions to aggregate productivity levels than restructuring-related entry and exit, despite firms involved in restructuring exhibiting higher productivity levels on average.

The final rows of Table 2 report the weighted sum of subgroup productivity contributions, the within-groups Olley–Pakes allocation component, and the aggregate labor

productivity of the manufacturing sector. The allocation component proves quantitatively large, ranging between approximately 6 and 17 thousand euros per employee, corresponding to roughly 9–23 percent of aggregate labor productivity in the manufacturing sector.

While the static decomposition provides a useful snapshot of the contributions of different firm subgroups to aggregate productivity levels, it does not reveal how productivity changes over time. To examine the dynamics of productivity growth associated with firm turnover, restructuring, and M&A, we next turn to an intertemporal decomposition of productivity change.

5.3 Intertemporal productivity decomposition in the short run

In this subsection, we apply the intertemporal decomposition of the productivity change introduced in Proposition 2. This decomposition allows aggregate productivity growth to be partitioned into contributions arising from continuing firms, M&A, genuine firm entry and exit, restructuring-related entry and exit, and within-group reallocation.

We begin with a short-run perspective by dividing the twelve-year study period into four three-year subperiods: 2010–2013, 2013–2016, 2016–2019, and 2019–2022. The results of the short-run decomposition are presented in Table 3.

Table 3: Short-run intertemporal decomposition of labor productivity change in manufacturing (% per year).

	2010–2013	2013–2016	2016–2019	2019–2022
Continuing (no M&A)	1.46	1.12	0.66	3.07
+ Continuing (M&A acquirers)	-4.63	-3.84	-0.11	-0.12
+ Restructuring entry - exit	0.30	0.21	0.02	-0.15
+ Genuine entry - exit	0.31	0.71	-0.02	0.34
= Weighted sum of subgroups	-2.55	-1.80	0.54	3.14
+ Within groups reallocation	0.44	5.26	-2.84	5.63
= Manufacturing sector total	-2.11	3.47	-2.30	8.77

The large baseline group of continuing firms without M&A events exhibits positive productivity growth in all four subperiods. Productivity growth falls below one percent during the subperiod 2016–2019 but rises to approximately three percent during the final subperiod 2019–2022. In contrast, firms classified as M&A acquirers exhibit a negative incremental contribution to productivity growth in all four short-run subperiods. This pattern should not be interpreted as a causal effect of acquisitions. Rather, it reflects a combination of selection into acquisition activity and short-run integration dynamics

(see Figure 3). In particular, acquisition events mechanically combine workforces and production units with heterogeneous productivity levels, which tends to reduce measured labor productivity in the short run, even if the underlying efficiency is unchanged.

The third component captures the contribution of restructuring-related entry and exit. This component is small but positive in the first two subperiods, 2010–2013 and 2013–2016 (0.30 and 0.21 percent per year, respectively), and near zero or slightly negative in the later subperiods (0.02 and −0.15 percent per year). Notably, the contribution of restructuring-related entry and exit remains smaller in magnitude than the contribution of genuine firm turnover across all subperiods (fourth component), despite the fact that firms involved in restructuring typically exhibit higher productivity levels than firms entering or exiting through genuine market turnover.

The fourth component captures Schumpeterian creative destruction by comparing the productivity levels of genuinely entering firms with those of firms exiting the market through liquidation. The contribution of genuine firm turnover is positive in three of the four subperiods, ranging from 0.31 to 0.71 percent per year. The sole exception is the subperiod 2016–2019, when the contribution is marginally negative (−0.02 percent per year), indicating a temporary reversal in which exiting firms were on average somewhat more productive than new entrants during this period.

Finally, the intertemporal decomposition includes an Olley–Pakes-type reallocation component capturing changes in the allocation of employment across firms within the continuing subgroups. This component proves to be the main driver of aggregate productivity fluctuations at the sector level. In the third subperiod, within-group reallocation contributes negatively to aggregate productivity growth (−2.84 percent per year), whereas in other subperiods it contributes positively (between 0.44 and 5.63 percent per year).

Importantly, the large reallocation component does not necessarily imply that a large number of workers moved from high-productivity firms to low-productivity firms, or vice versa. Rather, it mainly reflects the differences in productivity dynamics between large and small firms. For example, if a few very large manufacturing firms experience negative productivity shocks, while a majority of smaller firms experience positive productivity growth, the average productivity change within groups may remain positive even though aggregate sectoral productivity declines. Such patterns are consistent with the negative aggregate productivity growth observed during the 2016–2019 subperiod.

5.4 Medium and long run intertemporal productivity decompositions

To examine whether the short-run patterns persist over longer horizons, we next consider medium- and long-run decompositions. Specifically, we analyze the two six-year subpe-

riods 2010–2016 and 2016–2022, corresponding to the periods used earlier in the static decomposition. For comparison, we also consider the entire twelve-year study period of 2010–2022. The results are presented in Table 4.

Table 4: Medium- and long-run intertemporal decomposition of labor productivity change in manufacturing (% per year).

	2010–2016	2016–2022	2010–2022
Continuing (no M&A)	1.30	2.00	1.80
+ Continuing (M&A acquirers)	-0.13	0.00	-0.17
+ Restructuring entry - exit	-0.05	0.02	-0.03
+ Genuine entry - exit	0.14	0.08	0.09
= Weighted sum of subgroups	1.26	2.10	1.69
+ Within groups reallocation	-0.68	0.92	0.12
= Manufacturing sector total	0.58	3.03	1.80

Comparing the short- and longer-run decompositions suggests that the contribution of restructuring is largely transitional in nature. While restructuring activity influences short-run productivity dynamics through temporary reallocation and integration effects, these influences diminish when productivity change is averaged over longer horizons. This pattern indicates that restructuring primarily reshapes the short-run distribution of productivity across firms rather than constituting an independent long-run source of aggregate productivity growth.

Extending the time horizon somewhat refines the picture. It should be noted that the firm subgroups are constructed separately for each subperiod; therefore, the composition of subgroups differs slightly across the decompositions reported in Tables 3 and 4. The large majority of continuing firms without M&A activity exhibit solid positive productivity growth across all time horizons considered. Therefore, this group remains the primary contributor to aggregate productivity growth in the manufacturing sector.

The subgroup of M&A acquirers continues to exhibit a negative contribution to aggregate productivity growth over medium-run horizons, although the magnitude of the negative contribution is smaller than that in the short-run decomposition. In the subperiod 2016–2022, the contribution of M&A acquirers to productivity growth is approximately zero.

The contribution of genuine entry and exit, representing Schumpeterian creative destruction, remains small but positive across medium-run decompositions. The magnitude of this contribution is somewhat smaller over medium-run horizons (0.14 and 0.08 percent per year for 2010–2016 and 2016–2022, respectively) than the higher end of the short-run estimates in Table 3, which reflects the contribution of genuine entry and exit being

particularly large during 2013–2016 (0.71 percent per year) and relatively modest in the other three-year subperiods. The contribution of restructuring-related entry and exit is small and close to zero across all time horizons considered (−0.05, 0.02, and −0.03 percent per year for the two medium-run subperiods and the full period, respectively). The contribution of restructuring events remains smaller in magnitude than that of genuine firm turnover.

Finally, the within-group Olley–Pakes reallocation component remains quantitatively important but less volatile over longer time horizons. This finding supports the interpretation that the large reallocation effects observed in the short-run decomposition are driven primarily by productivity fluctuations among a small number of very large manufacturing firms. When productivity changes are averaged over longer periods of six or twelve years, temporary shocks affecting large firms tend to cancel out, resulting in more stable sector-level productivity dynamics.

5.5 Robustness test: Alternative worker-cluster threshold

The baseline analyses presented in Sections 4 and 5 identify restructuring events using a 75 percent outflow and inflow threshold, motivated by the distribution of worker-cluster transitions shown in Figures 1 and 2. As a robustness check, we repeat the analysis using a lower threshold of 60 percent. Specifically, a predecessor-successor relationship is identified when at least 60 percent of the predecessor firm's workforce transfers to a successor firm or when at least 60 percent of the successor firm's workforce originates from a single predecessor firm.

The choice of threshold involves a trade-off between sensitivity and specificity. Higher thresholds reduce the risk of misclassifying genuine entry or exit as restructuring, whereas lower thresholds capture a broader range of organizational changes that may not involve complete workforce transfers. Benedetto et al. (Benedetto et al., 2007) use an 80 percent threshold to identify firm ID changes, mergers, and acquisitions, whereas firm-to-firm worker-cluster transitions below this threshold are interpreted as spin-offs, breakouts, or cases with unclear underlying causes. Hethey-Maier and Schmieder (2013) classify transitions above 80 percent as restructuring events and transitions between 30 and 80 percent as potentially ambiguous or "fuzzy" cases where it is unclear whether firm entries and exits are genuine.

Lowering the threshold to 60 percent mechanically increases the number of restructuring events identified in the data because smaller worker-cluster transfers are sufficient to establish a predecessor-successor relationship. Consequently, a larger number of firms are classified as restructuring entrants, restructuring exits, or M&A-related firms. The robustness results are reported in Appendix Table A1 and A2.

Despite the broader definition of restructuring, the results remain qualitatively similar

to the baseline specification. Continuing firms without M&A activity remain the dominant source of productivity growth, the contribution of M&A acquirers remains negative or close to zero, and within-group reallocation continues to account for a substantial share of aggregate productivity dynamics. Although some individual estimates differ in magnitude, the overall pattern of results and the main conclusions remain unchanged. Overall, the similarity of the results obtained using the 75 percent and 60 percent thresholds suggests that the main conclusions of the paper are not sensitive to the specific worker-flow threshold used to identify restructuring events.

5.6 Evidence from private service industries

To assess whether the findings obtained for manufacturing generalize to other sectors of the economy, we replicate the intertemporal productivity decomposition for private service industries using the same worker-flow classification and the baseline 75 percent threshold. The results are reported in Tables 5 and 6.

Overall, the service-sector results are broadly consistent with the findings for manufacturing. Continuing firms without M&A activity remain the dominant source of productivity growth across all decomposition horizons. As shown in Table 5, the contribution of continuing firms ranges from 0.70 to 3.24 percentage points per year in the short run. Similarly, Table 6 shows that continuing firms account for the majority of productivity growth over the six-year and twelve-year horizons, contributing between 0.97 and 2.20 percentage points annually.

Table 5: Short-run intertemporal decomposition of labor productivity change in private service industries (% per year).

	2010–2013	2013–2016	2016–2019	2019–2022
Continuing (no M&A)	1.09	1.26	0.70	3.24
+ Continuing (M&A acquirers)	-4.24	-4.37	0.00	-0.05
+ Restructuring entry - exit	1.84	1.79	-0.03	-0.13
+ Genuine entry - exit	0.25	0.38	-0.03	0.20
= Weighted sum of subgroups	-1.06	-0.94	0.64	3.25
+ Within groups reallocation	3.19	5.16	-2.93	0.75
= Private service industries total	2.13	4.22	-2.28	3.99

Table 6: Medium- and long-run intertemporal decomposition of labor productivity change in private service industries (% per year).

	2010–2016	2016–2022	2010–2022
Continuing (no M&A)	0.97	2.20	1.60
+ Continuing (M&A acquirers)	-0.04	-0.03	-0.04
+ Restructuring entry - exit	0.02	-0.22	-0.04
+ Genuine entry - exit	0.01	0.07	-0.34
= Weighted sum of subgroups	0.96	2.03	1.18
+ Within groups reallocation	2.33	-1.34	0.91
= Private service industries total	3.28	0.69	2.08

A notable difference compared with manufacturing concerns restructuring-related entry and exit. In the first two short-run subperiods, the contribution of restructuring-related entry and exit to productivity growth is substantially larger in private service industries than in manufacturing. During 2010–2013 and 2013–2016, restructuring-related entry and exit contributed 1.84 and 1.79 percentage points per year, respectively (Table 5), compared with less than 0.30 percentage points in manufacturing. This finding suggests that organizational restructuring plays a more important role in short-run productivity dynamics in private service industries than in manufacturing.

In contrast, the contribution of genuine entry and exit remains relatively modest throughout most subperiods. During the first half of the sample period, restructuring-related turnover makes a considerably larger contribution to productivity growth than genuine market turnover. However, the medium- and long-run decomposition results reported in Table 6 indicate that this difference largely disappears over longer horizons. The contribution of restructuring-related entry and exit converges toward zero, while the contribution of genuine entry and exit also remains small. Over the full period 2010–2022, the contribution of genuine entry and exit is slightly negative (−0.34 percent per year), indicating that genuine market turnover contributed less to aggregate productivity growth in private service industries than in manufacturing during the study period.

6 Conclusions

This study demonstrates that a substantial share of measured firm entry and exit in administrative data reflects corporate restructuring rather than genuine market creation or destruction. By exploiting worker-flow information, we introduce a more granular classification of firm dynamics that separates genuine entry and exit from mergers, acquisitions, and restructuring-related transitions. Incorporating this classification into an

aggregation-consistent productivity decomposition reveals that firms involved in restructuring exhibit systematically higher productivity levels than genuinely entering or exiting firms. However, these restructuring-related transitions contribute only modestly to aggregate productivity growth. Instead, genuine market entry and exit remain the dominant structural mechanism underpinning creative destruction and productivity growth.

Our empirical results reveal several key findings. First, firms involved in restructuring exhibit significantly higher levels of labor productivity than firms entering or exiting through genuine market turnover. Firms exiting through corporate restructuring exhibit substantially higher productivity than those exiting through liquidation. Similarly, restructuring entrants, such as spin-offs and phoenix firms, begin with higher productivity levels than genuinely new firms. Nevertheless, genuine entry and exit associated with Schumpeterian creative destruction make a larger positive contribution to aggregate productivity growth than restructuring-related firm turnover. These findings highlight the importance of distinguishing between genuine market turnover and corporate restructuring when analyzing productivity dynamics.

Second, firms that undertake acquisitions exhibit distinct productivity trajectories. Labor productivity typically declines sharply at the time of acquisition, followed by a gradual recovery in subsequent years. As a result, M&A acquirers make a negative contribution to aggregate productivity growth in the short-run decomposition. In the medium run, the productivity contribution of acquiring firms is close to zero and remains below the productivity growth observed among continuing firms without M&A activity. Given the limited length of the twelve-year observation period, the long-run productivity effects of acquisitions remain an open question for future research.

Third, the within-group Olley–Pakes-type reallocation component proves to be a major driver of short-run fluctuations in aggregate productivity. However, in the medium run, the large swings in this component largely cancel out. This pattern suggests that the reallocation term is driven primarily by productivity shocks affecting a small number of very large manufacturing firms. For example, productivity developments in industries, such as paper and pulp production, are highly sensitive to global demand shocks.

Overall, the results indicate that productivity growth in Finnish manufacturing during the study period was primarily driven by productivity improvements among continuing firms without M&A activity. At the same time, mergers, acquisitions, and restructuring events played an important role in shaping the structure of the sector.

An interesting question for future research is whether the observed patterns reflect elevated restructuring activity or rational adjustment to structural pressures in declining industries. For example, mergers and restructuring may represent rational survival strategies in sectors facing declining global demand. Because our analysis cannot observe the counterfactual evolution of firms in the absence of such restructuring, it is possible that some of these firms would otherwise have exited the market entirely.

From a policy perspective, our findings raise important questions regarding the relationship between corporate restructuring and aggregate productivity performance. The observation that firms involved in restructuring operate at systematically higher productivity levels than genuinely entering or exiting firms suggests that M&A and restructuring activities are largely confined to the more productive segment of the firm distribution. However, the negative short-run contribution of M&A acquirers to aggregate productivity growth is consistent with integration costs and organizational disruptions that temporarily reduce measured productivity. Together, these two observations point to a distinction between the selection of firms into restructuring events and the productivity consequences of those events, a distinction that warrants careful consideration in competition policy evaluations of merger transactions.

The methodology introduced in this study is transferable to other country contexts and time periods wherever firm-level financial records and matched employer-employee administrative data are jointly available. Applying the worker-flow classification scheme to other economies would allow researchers to assess whether the patterns documented for Finnish manufacturing are specific to the Finnish institutional setting or represent more general features of industrial dynamics. The relatively small and open Finnish economy may exhibit different restructuring dynamics compared to larger and more closed economies, where internal capital markets and domestic acquisition targets play a more prominent role. Cross-country comparisons would also help clarify whether the magnitude of restructuring-related firm turnover is driven by country-specific institutional factors such as bankruptcy laws, labor market flexibility, or the degree of capital market development.

Several limitations of the present study merit acknowledgment. First, the identification of restructuring events relies exclusively on worker flows and does not draw on direct information about ownership changes, merger contracts, or legal records. While clustered worker flows provide a practical and transparent indicator of organizational restructuring in administrative data, they may miss some transactions in which workforce continuity is not preserved and may generate false positives in industries with naturally high rates of coordinated labor mobility. Second, the decomposition framework measures contributions in terms of labor productivity rather than total factor productivity, which means that changes in capital intensity associated with acquisitions are not separately identified. Third, although the study period of 2010–2022 spans twelve years, it is insufficient to observe the full long-run productivity trajectory following an acquisition, given that integration processes often extend beyond five years. Extending the analysis to longer time horizons as additional data become available would help resolve the remaining uncertainty about the long-run productivity consequences of M&A activity.

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Appendix A. Robustness check

Intertemporal decomposition using a 60 percent worker-cluster threshold.

Table A1: Short-run intertemporal decomposition of labor productivity change in manufacturing (% per year).

	2010–2013	2013–2016	2016–2019	2019–2022
Continuing (no M&A)	1.46	1.12	0.66	3.07
+ Continuing (M&A acquirers)	-4.65	-4.04	-0.23	-0.30
+ Restructuring entry - exit	0.21	0.28	0.01	-0.07
+ Genuine entry - exit	0.35	0.74	-0.03	0.32
= Weighted sum of subgroups	-2.63	-1.89	0.41	3.02
+ Within groups reallocation	0.52	5.36	-2.71	5.75
= Manufacturing sector total	-2.11	3.47	-2.30	8.77

Table A2: Medium- and long-run intertemporal decomposition of labor productivity change in manufacturing (% per year).

	2010–2016	2016–2022	2010–2022
Continuing (no M&A)	1.30	2.00	1.80
+ Continuing (M&A acquirers)	-0.17	0.01	-0.17
+ Restructuring entry - exit	-0.05	0.02	-0.03
+ Genuine entry - exit	0.14	0.04	0.08
= Weighted sum of subgroups	1.21	2.07	1.67
+ Within groups reallocation	-0.63	0.96	0.13
= Manufacturing sector total	0.58	3.03	1.80

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