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Business dynamism and productivity growth in Belgium

May 2021

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Abstract – This paper considers the evolution in business dynamism and its potential link with productivity growth in Belgium. Statistics on business creation, the exit of enterprises and within-industry reallocation are presented. Data on Belgian firms, covering the period 2003-2017, are used for a decomposition of productivity growth, to assess the relative contribution to industry-level productivity growth, of entry and exit, reallocation of shares in industry output and firm-level productivity growth. The paper provides robust indications of the substantial contribution of productivity growth of start-ups in the early years after entry.

Jel Classification – D22, D24, L25, L26, M13

Keywords – Entry, start-ups, young firms, exit, reallocation, efficiency, productivity growth

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Executive summary

Besides firm-level productivity growth, the entry and exit of firms and the reallocation of market shares between incumbents can also contribute to the productivity growth of industries. Start-ups may challenge mature firms and rejuvenate industries by introducing new products; services; technologies and organizational forms. Incumbents can react to the competitive pressure from start-ups in several ways but the least productive may be forced to exit. Reallocation can be productivity-enhancing if resources shift from firms with low productivity towards firms with high productivity.

Declining business dynamism has recently been put forward as a potential explanation for the long-term slowdown in productivity growth, as witnessed in most OECD countries. This paper considers evidence on business dynamism and the potential link with productivity growth in Belgium.

There are different concepts and data sources for business creation. The broadest concept is VAT registrations, which is obligatory for most market activities in Belgium. A narrower concept is the creation of corporations. An important distinction is between enterprises with employees and enterprises without employees. The latter include self-employed entrepreneurs that do not employ any workers but also corporations that are created for tax purposes or real estate portfolio management. Although self-employed entrepreneurs play an important role in some industries, enterprises without employees are probably more necessity-driven and opportunity-driven than growth-driven and therefore less relevant from the perspective of industry growth than enterprises with employees that comprise enterprises with the ambition to innovate and grow. Data on enterprises with employees, only available for a relatively short period, do not show a decline of entry for Belgium but rather a stabilization at a low level, compared with other EU countries. Data on the creation of corporations, available for a longer period, indicate that the start-up rate in Belgium increased substantially in the 1980s, dropped dramatically in the first half of the 1990s and stagnated at a low level ever since. The exit of enterprises with employees is even lower in Belgium and appears to decline further. Compared with other EU countries, Belgium also has a low share of high-growth firms and, more generally, a low share of growth-driven entrepreneurs.

Periods of low economic growth are often characterized by an increased exit of low-productive firms ('cleansing'), but also by negative and potentially long-lasting negative effects ('scarring') such as a decrease in business creation. This appears to have been the case during the so-called Great Recession that followed the 2007-2008 global financial crisis. Recent data show that the Covid-19 crisis, despite its dramatic economic impact, so far has not resulted in a decrease in business creation or an increase in bankruptcies. The number of corporations created in April and May 2020, at the start of the Covid-19 crisis in Belgium, was well below the level in the same months in 2019. However, from June 2020 onwards, business creation surpassed the level of previous years, to the extent that in the period March-December 2020, more corporations have been created than in the same period for the years 2015-2019. The number of bankruptcies, on a structural downward trend in Belgium, was extremely low from March 2020 onwards, explained by two moratoriums on bankruptcies but also by the fact that the Federal Public Service Finance and the National Social Security Office did not push for the bankruptcy of firms with overdue payment of taxes or social contributions. Moreover, companies and self-employed entrepreneurs received substantial support at the federal, regional, and local level, such as temporary unemployment

benefits for affected employees, payment plans for taxes and social security contributions and replacement income for the self-employed (bridging right). So, although the predicted surge in bankruptcies has not materialized yet, it remains to be seen what will happen when support measures are scaled back or wound down.

Job reallocation – the sum of job creation and job destruction relative to total employment – decreased in most OECD countries, slightly more in market services than in manufacturing industries. Job reallocation also decreased in Belgium but slightly less than in other countries.

A positive correlation between business dynamism and productivity growth does not necessarily prove a causal relationship. Declining business dynamism and productivity growth slowdown may both result from the maturing of industries, a decrease in growth opportunities or demographic changes. Tests of causality of the link between entry, exit and productivity growth in Belgium, reported in this paper, show that the results crucially depend on whether value added, or gross output is considered as a measure of output and provide mixed evidence on the potential causal link between business dynamism and productivity growth.

This paper reports the results of a decomposition of productivity growth, using data on Belgian firms over the period 2003-2017. This decomposition does not aim at detecting causal links but at assessing the relative contribution of four components of industry-level productivity growth: the entry of firms; the exit of firms; the reallocation of market shares between incumbents and firm-level productivity growth. For the decomposition, four alternative estimates of productivity are considered, resulting from two different estimation procedures, and considering two alternative output measures (value added and gross output).

In the decomposition, incumbents are broken down into three separate age groups: start-ups (1-4 years after entry); young firms (5-9 years old) and mature firms (10 years or more). This breakdown appears to be relevant, as there are substantial differences across age groups, in the extent, and even the sign of, for example, the contribution of reallocation and the contribution of firm-level productivity growth to industry-level productivity growth. A decomposition that considers all incumbents, irrespective of age, would not reveal these differences across age groups, that provide useful information on age-specific patterns.

The results of the decomposition depend on which productivity estimate is considered, probably explained by well-known biases in the estimation of productivity that cannot be satisfactorily tackled with the data at hand. Especially results with respect to the contribution of the entry of firms appear rather sensitive, with conflicting conclusions even as to the sign of the contribution.

The relative contribution of firm exit is negative, somewhat surprisingly as exiting firms on average tend to have productivity below the industry average. The negative contribution follows from a small group of exiting firms that have above-average productivity and a larger share in industry output than the substantially larger group of exiting firms with below-average productivity but also a smaller share in industry output. Future research could assess whether the high-productive firms that exited were involved in mergers and acquisitions, which would imply that they continued their activities and that the exit is administratively rather than a real exit.

Somewhat more robust conclusions can be found for reallocation. Start-ups seem to go through a phase of market experimentation and the establishment of a customer base where selection does not occur based on productivity, as many low-productive start-ups witness an increase in their market share in the early years after entry. For mature firms, reallocation is more productivity-enhancing. Mature firms with productivity above (below) the industry average, tend to gain (loose) market shares. This process of market share growth, irrespective of the initial productivity level, and substantial productivity growth of start-ups, appears to be more pronounced in market services than in manufacturing industries.

The most robust conclusion of the decomposition of productivity growth is the strongly positive contribution of firm-level productivity growth. When the component is broken down by age, productivity growth of start-ups by far contributes most to industry-level productivity growth. This finding confirms the results of previous studies of the crucial role of start-ups in industry-level productivity growth. A more worrying conclusion is the decline in the relative productivity of entrants (in the year of entry) as well as the decreased positive contribution of productivity growth of start-ups (defined as firms 1 up to 4 years after entry).

With the usual caveat of data and methodological limitations, the decomposition analysis in this paper suggests that the low level of business dynamism in Belgium, or its trend over time, does not offer a silver bullet explanation for the structural decline in industry-level productivity growth. Firms appear to witness intrinsic problems to raise, or even sustain, productivity growth. However, the low exit rate in Belgium may indicate the existence of barriers to the exit of low-productive firms that could limit opportunities for start-ups, which are found to be crucial for industry-level productivity growth. Regulatory barriers and administrative burdens, weak contract enforcement, financing constraints or inefficient bankruptcy procedures are often put forward as factors that raise barriers to entry and exit. The low entry, especially of growth-driven entrepreneurs, justifies policies that support this kind of entrepreneurship during the start-up and scale-up stages.

Synthese

Naast de productiviteitsgroei van bedrijven, kunnen ook de toe- en uittreding van ondernemingen en de verschuiving van marktaandelen tussen gevestigde bedrijven, bijdragen aan de productiviteitsgroei van bedrijfstakken. Startende ondernemingen kunnen gevestigde bedrijven uitdagen en bedrijfstakken verjongen door nieuwe producten; diensten; technologieën en organisatievormen te introduceren. Gevestigde bedrijven kunnen op verschillende manieren reageren op de concurrentiedruk van start-ups, maar de minst productieve onder hen kunnen gedwongen worden om hun activiteiten stop te zetten. Herverdeling tussen gevestigde bedrijven kan productiviteitsverhogend zijn als productiemiddelen verschuiven van bedrijven met een lage productiviteit naar bedrijven met een hoge productiviteit.

Afnemende bedrijfsdynamiek wordt recent aangehaald als een mogelijke verklaring voor de structurele vertraging van de productiviteitsgroei in de meeste OESO-landen. Deze working paper beschouwt het niveau, en de evolutie, van bedrijfsdynamiek en het mogelijke verband met de productiviteitsgroei in België.

Er zijn verschillende concepten en gegevensbronnen over ondernemerschap. Een ruime definitie beschouwt btw-registratie, die verplicht is voor de meeste marktactiviteiten in België. Een iets strikter concept is de oprichting van een onderneming waarbij er een belangrijk onderscheid is tussen ondernemingen met werknemers en ondernemingen zonder werknemers. Onder ondernemingen zonder werknemers vallen zelfstandige ondernemers die geen werknemers in dienst hebben, maar ook bedrijven die zijn opgericht voor belastingdoeleinden of vastgoedportefeuillebeheer. Hoewel zelfstandige ondernemers in sommige bedrijfstakken een belangrijke rol spelen, zijn ondernemingen zonder werknemers waarschijnlijk minder groei-gedreven en daarom minder relevant vanuit het perspectief van de groei van een bedrijfstak, dan ondernemingen met werknemers die ondernemingen omvatten met de ambitie om te innoveren en te groeien. Gegevens over ondernemingen met werknemers, die slechts voor een relatief korte periode beschikbaar zijn, tonen geen daling van de toetreding voor België, maar eerder een stabilisatie op een laag niveau, in vergelijking met andere EU-landen. Uit gegevens over de oprichting van vennootschappen, die voor een langere periode beschikbaar zijn, blijkt dat het aantal start-ups in België in de jaren 1980 aanzienlijk is gestegen, in de eerste helft van de jaren 1990 dramatisch is gedaald en sindsdien op een laag niveau is gestagneerd. De uittreding van ondernemingen met werknemers is in België nog lager en lijkt verder af te nemen. In vergelijking met andere EU-landen heeft België ook een laag aandeel snelgroeiende bedrijven en, meer in het algemeen, een laag aandeel groeigedreven ondernemers.

Jaren van lage economische groei worden vaak gekenmerkt door een toegenomen exit van laagproductieve bedrijven ('cleansing'), maar ook door potentieel langdurige negatieve effecten ('scarring'), zoals een afname van de creatie van ondernemingen. Dit lijkt het geval te zijn geweest tijdens de zogenaamde Grote Recessie die volgde op de wereldwijde financiële crisis van 2007-2008. Recente gegevens tonen aan dat de Covid-19-crisis, ondanks de dramatische economische impact, tot nu toe niet heeft geleid tot een afname van het aantal startende ondernemingen of een toename van het aantal faillissementen. Het aantal bedrijven dat in april en mei 2020 werd opgericht, aan het begin van de Covid-19-crisis in België, lag ver onder het niveau in dezelfde maanden in 2019. Vanaf juni 2020 overtrof de oprichting van

bedrijven echter het niveau van voorgaande jaren, in die mate dat in de periode maart-december 2020 meer bedrijven zijn opgericht dan in dezelfde periode voor de jaren 2015-2019. Het aantal faillissementen, dat al enige tijd een dalende trend vertoont in België, was vanaf maart 2020 zeer laag, verklaard door twee moratoriums op faillissementen maar ook door het feit dat de Federale Overheidsdienst Financiën en de Rijksdienst voor Sociale Zekerheid niet hebben aangedrongen op het faillissement van ondernemingen met achterstallige betaling van belastingen of socialezekerheidsbijdragen. Bovendien kregen bedrijven en zelfstandigen aanzienlijke steun op federaal, regionaal en lokaal niveau, zoals tijdelijke werkloosheidsuitkeringen voor getroffen werknemers, betalingsplannen voor belastingen en socialezekerheidsbijdragen en vervangingsinkomen voor zelfstandigen (overbruggingsrecht). Hoewel de voorspelde toename van het aantal faillissementen zich nog niet heeft voorgedaan, is het de vraag wat er zal gebeuren als de steunmaatregelen worden teruggeschroefd of aflopen.

De herverdeling van banen – de som van gecreëerde en verloren banen ten opzichte van de totale werkgelegenheid – is in de meeste OESO-landen gedaald, iets meer in marktdiensten dan in de verwerkende industrie. Ook in België daalde de herverdeling van banen, maar iets minder dan in andere landen.

Een positieve correlatie tussen bedrijfsdynamiek en productiviteitsgroei bewijst niet noodzakelijkerwijs een oorzakelijk verband. Afnemende bedrijfsdynamiek en vertraging van de productiviteitsgroei kunnen beide het gevolg zijn van stagnerende bedrijfstakken, een afname van groeimogelijkheden of demografische factoren. Tests van het oorzakelijk verband tussen toetreding, uitreding en productiviteitsgroei in België, gerapporteerd in deze paper, tonen aan dat de resultaten cruciaal afhangen van de vraag of de toegevoegde waarde of de omzet wordt beschouwd als een maatstaf voor de output van een onderneming en leveren geen eenduidige conclusies over het potentiële oorzakelijke verband tussen bedrijfsdynamiek en productiviteitsgroei.

Deze paper toont de resultaten van een decompositie van de productiviteitsgroei, gebruikmakend van gegevens over Belgische bedrijven over de periode 2003-2017. Deze decompositie is niet gericht op het opsporen van oorzakelijke verbanden, maar op het beoordelen van de relatieve bijdrage van vier componenten van de productiviteitsgroei op bedrijfstakniveau: de toetreding van bedrijven; de uittreding van bedrijven; de herverdeling van marktaandelen tussen gevestigde ondernemingen en productiviteitsgroei op bedrijfsniveau. Voor de decompositie worden vier alternatieve productiviteitsschattingen gebruikt op basis van twee verschillende schattingsprocedures en twee alternatieve indicatoren van de output van een onderneming (toegevoegde waarde en omzet).

Voor de decompositie worden gevestigde bedrijven onderverdeeld in drie afzonderlijke leeftijdsgroepen: start-ups (1-4 jaar na toetreding); jonge bedrijven (5-9 jaar) en volwassen bedrijven (10 jaar of ouder). Deze uitsplitsing lijkt relevant, aangezien er aanzienlijke verschillen zijn tussen leeftijdsgroepen, in de omvang, en zelfs het teken van bijvoorbeeld de bijdrage van herverdeling, en productiviteitsgroei op bedrijfsniveau, aan de productiviteitsgroei op bedrijfstakniveau. Een decompositie die alle gevestigde ondernemingen beschouwt, ongeacht hun leeftijd, zou deze verschillen tussen leeftijdsgroepen, die nuttige informatie verschaffen over leeftijdsspecifieke patronen, niet aan het licht brengen.

De resultaten van de decompositie hangen af van welke productiviteitsschatting wordt overwogen, waarschijnlijk door gekende vertekeningen in de schatting van productiviteit, die onvoldoende kunnen worden opgelost met de beschikbare bedrijfsgegevens. Vooral de resultaten met betrekking tot de

bijdrage van de toetreding van ondernemingen lijken nogal gevoelig, met tegenstrijdige conclusies, zelfs met betrekking tot het teken van de bijdrage.

De relatieve bijdrage van de uittreding van bedrijven is negatief, enigszins verrassend, aangezien uittredende bedrijven gemiddeld een productiviteit onder het bedrijfstakgemiddelde hebben. De negatieve bijdrage vloeit voort uit een kleine groep uittredende ondernemingen met een productiviteit boven het gemiddelde en een groter aandeel in de productie van de bedrijfstak dan de aanzienlijk grotere groep van uittredende ondernemingen met een lage productiviteit, maar ook met een kleiner aandeel in de productie van de bedrijfstak. In toekomstig onderzoek zou kunnen worden nagegaan of de hoogproductieve bedrijven die hun activiteiten blijken te hebben stopgezet, betrokken waren bij fusies en overnames, wat zou betekenen dat ze hun activiteiten voortzetten en dat hun uitteding eerder administratief is dan een echte uittreding.

Er zijn meer robuuste conclusies te vinden voor de relatieve bijdrage van herverdeling. Start-ups lijken na toetreding een experimentele fase door te maken, gericht op het opbouwen van een klantenbestand, waarbij selectie niet plaatsvindt op basis van productiviteit, aangezien veel laagproductieve start-ups in de eerste jaren na toetreding hun marktaandeel zien toenemen. Voor volwassen bedrijven is herverdeling wel productiviteitsverhogend. Volwassen bedrijven met een productiviteit boven (onder) het bedrijfstakgemiddelde zien hun marktaandeel doorgaans toenemen (afnemen). Dit proces van groei van het marktaandeel, ongeacht het aanvankelijke productiviteitsniveau, en een aanzienlijke productiviteitsgroei van start-ups, lijkt sterker te zijn in marktdiensten dan in de verwerkende industrie.

De meest robuuste conclusie van de decompositie van de productiviteitsgroei is de sterk positieve bijdrage van de productiviteitsgroei van bedrijven. Wanneer deze component wordt uitgesplitst naar de leeftijd van bedrijven, dan blijkt dat de productiviteitsgroei van start-ups veruit het meest bijdraagt aan de productiviteitsgroei van een bedrijfstak. Deze bevinding bevestigt de conclusie van eerdere studies van de cruciale rol van start-ups voor de productiviteitsgroei van bedrijfstakken. Een zorgwekkendere vaststelling is de daling van de relatieve productiviteit van toetredende bedrijven en de verminderde positieve bijdrage van de productiviteitsgroei van start-ups.

Met het gebruikelijke voorbehoud vanwege gekende beperkingen van gegevens en methodologie, suggereert de decompositie in deze paper dat het lage niveau van bedrijfsdynamiek in België, of de evolutie ervan, geen definitieve verklaring biedt voor de structurele daling van de productiviteitsgroei in de meeste bedrijfstakken. Bedrijven lijken intrinsieke problemen te ondervinden om hun productiviteitsgroei te verhogen of zelfs te handhaven. De lage graad van uittreding van bedrijven in België kan echter wijzen op het bestaan van belemmeringen voor laagproductieve bedrijven om hun activiteiten stop te zetten. Dit kan de kansen voor start-ups, die van cruciaal belang blijken te zijn voor productiviteitsgroei, beperken. Regelgeving en administratieve lasten, zwakke contracthandhaving, financieringsbeperkingen of inefficiënte faillissementsprocedures worden vaak naar voren gebracht als factoren die de toeen uittreding van ondernemingen kunnen belemmeren. De lage instroom, met name van groei-gedreven ondernemers, rechtvaardigt beleid dat dit soort ondernemerschap ondersteunt, tijdens de opstart, maar ook tijdens de fase van doorgroei na toetreding.

Synthèse

La croissance de la productivité des branches d'activité peut résulter non seulement de la croissance de la productivité des entreprises qui les composent, mais aussi de l'entrée et de la sortie de celles-ci et de la redistribution de parts de marché entre elles. Les start-up peuvent défier les entreprises bien établies et redynamiser les branches en introduisant de nouveaux produits, services, technologies et modes d'organisation. Les entreprises en place peuvent réagir de plusieurs manières à la pression concurrentielle exercée par les jeunes pousses, mais les moins productives peuvent être poussées vers la sortie. La redistribution des parts de marché peut améliorer la productivité si les ressources sont réaffectées des entreprises à faible productivité vers les entreprises à forte productivité.

La baisse du dynamisme entrepreneurial a récemment été avancée comme une explication possible de la persistance du ralentissement de la croissance de la productivité, tel qu'on l'observe dans la plupart des pays de l'OCDE. Cette étude examine les données sur le dynamisme des entreprises et le lien éventuel avec la croissance de la productivité en Belgique.

Il existe différents concepts et sources de données se rapportant à la création d'entreprises. Le concept le plus large est l'enregistrement à la TVA, qui est obligatoire pour la plupart des activités marchandes en Belgique. La création de sociétés est un concept plus étroit. Une distinction importante est opérée entre les entreprises qui emploient des salariés et les entreprises sans salariés. Ces dernières englobent les entrepreneurs indépendants qui n'emploient aucun travailleur, mais aussi les sociétés créées à des fins fiscales ou pour la gestion d'un portefeuille immobilier. Bien que les entrepreneurs indépendants jouent un rôle important dans certaines branches, les entreprises sans salariés agissent probablement plus par nécessité et en fonction des opportunités que dans un objectif de croissance. Elles sont donc moins pertinentes, du point de vue de la croissance de la branche d'activité, que les entreprises avec des salariés qui englobent des entreprises voulant innover et se développer. Les données sur les entreprises avec salariés, qui ne sont disponibles que pour une période relativement courte, ne révèlent pas un déclin des entrées en Belgique mais plutôt une stabilisation à un faible niveau, et ce en comparaison avec d'autres pays de l'UE. Les données sur la création de sociétés, disponibles sur une plus longue période, indiquent que le taux de création en Belgique a augmenté considérablement dans les années 1980, a chuté de façon spectaculaire au cours de la première moitié des années 1990 et stagne à un faible niveau depuis lors. Les sorties d'entreprises avec salariés sont encore plus faibles en Belgique et semblent encore diminuer. Par rapport à d'autres pays de l'UE, la Belgique se caractérise également par une faible proportion d'entreprises à forte croissance et, plus généralement, une faible proportion d'entrepreneurs axés sur la croissance.

Les périodes de faible croissance économique vont souvent de pair avec des sorties plus nombreuses d'entreprises peu productives (« cleansing »), mais s'accompagnent aussi d'effets négatifs et potentiellement durables (« scarring ») tels qu'un recul de la création d'entreprises. Cela semble avoir été le cas durant la « Grande récession » qui a suivi la crise financière mondiale de 2007-2008. Des données récentes montrent que la crise de la Covid-19, malgré ses effets économiques très sévères, n'a pas entraîné jusqu'à présent de réduction des créations d'entreprises ou d'augmentation des faillites. Certes, le nombre de sociétés créées en avril et mai 2020, au début de la crise sanitaire en Belgique, était bien

inférieur au niveau enregistré les mêmes mois en 2019. Mais à partir de juin 2020, les créations d'entreprises ont été plus nombreuses que les années précédentes, si bien que durant la période mars-décembre 2020, davantage de sociétés ont été créées qu'au cours de la même période en moyenne pendant les années 2015-2019. Le nombre de faillites, qui connaît une baisse structurelle en Belgique, a été extrêmement faible à partir de mars 2020 en raison de deux moratoires sur les faillites mais aussi parce que le Service Public Fédéral des Finances et l'Office National de Sécurité Sociale n'ont pas mis en faillite les entreprises en retard de payement des impôts ou des cotisations sociales. En outre, les entreprises et les indépendants ont reçu un soutien important des autorités fédérales, régionales et locales, tels que le chômage temporaire pour leur personnel, les plans d'échelonnement de payement des impôts et des contributions sociales et le revenu de remplacement pour les indépendants (droit-passerelle). Dès lors, même si l'augmentation prévue prévisible des faillites ne s'est pas encore concrétisée, il reste à voir ce qui va se passer quand ces mesures de soutien seront réduites ou abandonnées.

La redistribution des emplois – soit la somme des créations et des destructions d'emplois par rapport à l'emploi total – s'est atténuée dans la plupart des pays de l'OCDE, un peu plus dans les services marchands que dans les branches manufacturières. Ce phénomène s'est également estompé en Belgique, mais un peu moins que dans les autres pays.

Une corrélation positive entre dynamisme entrepreneurial et croissance de la productivité n'implique pas nécessairement un lien de causalité. Une baisse du dynamisme entrepreneurial et un ralentissement de la croissance de la productivité peuvent s'expliquer par la maturité des branches, de moindres opportunités de croissance ou des changements démographiques. Les tests de causalité de la relation entre entrées, sorties et croissance de la productivité en Belgique présentés dans cette étude montrent que les résultats dépendent fortement de la question de savoir si la valeur ajoutée ou la production brute sont considérées comme une mesure de la production. Ces tests fournissent dès lors une indication mitigée sur le lien de causalité entre dynamisme entrepreneurial et croissance de la productivité.

Cette étude présente les résultats d'une décomposition de la croissance de la productivité, basée sur des données d'entreprises belges couvrant la période 2003-2017. Cette décomposition ne vise pas à établir des liens de causalité mais à évaluer la contribution relative de quatre composantes à la croissance de la productivité par branche : l'entrée et la sortie d'entreprises, la redistribution des parts de marché entre les entreprises existantes et la croissance de la productivité des entreprises qui composent ces branches. S'agissant de la décomposition, quatre estimations différentes de la productivité sont considérées, elles résultent de deux procédés d'estimation différents et s'appuient sur deux mesures alternatives de la production (la valeur ajoutée et la production brute).

Dans la décomposition, les entreprises existantes sont réparties en trois groupes d'âge distincts : les start-up (1 à 4 ans), les jeunes entreprises (5 à 9 ans) et les entreprises matures (10 ans ou plus). Cette répartition semble pertinente car il existe des différences substantielles entre les groupes d'âge dans l'étendue, et même dans le signe, par exemple, de la contribution de la redistribution et de la croissance de la productivité de l'entreprise à la croissance de la productivité de la branche d'activité dans son ensemble. Une décomposition qui prend en compte toutes les entreprises indépendamment de leur âge ne révélerait pas ces différences qui fournissent des renseignements utiles sur les tendances propres à l'âge.

Les résultats de la décomposition dépendent de l'estimation de la productivité prise en considération, ce qui s'explique probablement par des biais bien connus dans l'estimation de la productivité qui ne peuvent être traités de manière satisfaisante avec les données disponibles. En particulier, les résultats relatifs à la contribution des entrées des entreprises semblent assez instables et débouchent sur des conclusions parfois contradictoires quant au signe de la contribution.

La contribution relative des sorties d'entreprises est négative, ce qui est plutôt surprenant puisque les entreprises sur le départ ont, en moyenne, une productivité inférieure à la moyenne de la branche. La contribution négative s'explique par un petit groupe d'entreprises en cessation qui ont une productivité supérieure à la moyenne et une part plus importante dans la production de la branche, par rapport au groupe nettement plus large d'entreprises sortantes dont la productivité est inférieure à la moyenne et la part dans la production de la branche est également plus faible. Les futures recherches pourraient évaluer si les entreprises à forte productivité qui se sont retirées ont été englobées dans des fusions et acquisitions, ce qui indiquerait qu'elles ont poursuivi leurs activités et que leur retrait est administratif plutôt que réel.

Des conclusions quelque peu plus probantes peuvent être tirées pour la redistribution des parts de marché. Les start-up semblent passer par une phase d'expérimentation du marché et de création d'une clientèle où la sélection ne s'opère pas sur la base de la productivité, car de nombreuses start-up peu productives voient leur part de marché augmenter au cours des premières années suivant leur création. La redistribution est plus favorable à la productivité des entreprises matures. Les entreprises bien établies ayant une productivité supérieure (inférieure) à la moyenne de la branche ont tendance à gagner (perdre) des parts de marché. Ce processus de croissance des parts de marché, indépendant du niveau de productivité initial, et la croissance soutenue de la productivité des start-up, semblent être plus prononcés dans les services marchands que dans les branches manufacturières.

La conclusion la plus évidente qui se dégage de la décomposition de la croissance de la productivité est la contribution fortement positive de la croissance de la productivité des entreprises. La désagrégation de la composante par âge montre que c'est la croissance de la productivité des start-up qui contribue de loin le plus à la croissance de la productivité des branches. Cette conclusion confirme les résultats d'études antérieures sur le rôle crucial des start-up dans la croissance de la productivité des branches. Une conclusion plus préoccupante tient au recul de la productivité relative des entrants (dans l'année d'entrée) ainsi qu'au tassement de la contribution positive à la croissance de la productivité des nouvelles entreprises (de 1 à 4 ans).

Même si la méthodologie et les données présentent certaines limites, l'analyse de décomposition suggère que le faible dynamisme entrepreneurial en Belgique, ou sa tendance dans le temps, ne constitue pas une explication univoque du déclin structurel de la croissance de la productivité des branches d'activité. Les entreprises semblent rencontrer des problèmes intrinsèques pour accélérer, ou simplement maintenir, la croissance de leur productivité. Toutefois, le faible taux de sortie en Belgique peut indiquer l'existence d'obstacles à la sortie d'entreprises peu productives qui pourraient limiter les opportunités pour les jeunes pousses, dont on sait qu'elles sont cruciales pour la croissance de la productivité des branches. Les entraves réglementaires et les charges administratives, le faible respect des contrats, les contraintes de financement ou l'inefficacité des procédures de faillite sont souvent présentés comme des

facteurs qui renforcent les obstacles à l'entrée et à la sortie. Les faibles entrées, en particulier des entrepreneurs ciblant la croissance, justifient de mener des politiques qui soutiennent cet entrepreneuriat durant les phases de démarrage et d'expansion de l'activité.

1. Introduction

Declining business dynamism is one of the more recent additions on the extensive list of potential explanations for the long-term slowdown in productivity growth, as witnessed in most OECD countries. In theoretical models of firm dynamics there is a straightforward link between business dynamism and productivity growth, through a competitive process of productivity-enhancing reallocation of resources from firms with low productivity towards firms with high productivity (Hopenhayn 1992; Decker et al. 2016). The entry of new firms and the exit of incumbents are the most radical displays of such reallocation. In addition to the rate of creation of new businesses, the survival and post-entry growth of start-ups are also important features of business dynamism. From a Schumpeterian perspective, creative destruction is crucial for productivity growth as it is accompanied by the successful introduction of new products and services and the diffusion of new technologies and knowledge (Davis et al. 2007; Dejardin 2011; Dent et al. 2016; Gourio, Messer and Siemer 2016; Calvino, Criscuolo and Verlhac 2020).

A secular decline in business dynamism since the 1980s was first reported for the United States (Davis et al. 2007) and later confirmed for the last two decades for most OECD Countries (Calvino, Criscuolo and Verlhac 2020). According to Decker et al. (2017), a decrease in reallocation towards firms with high productivity can account for much of the decline in aggregate productivity growth between the late 1990s and the mid-2000 in the United States.

Business cycles and large macroeconomic shocks, such as the Great Recession that followed the global financial crisis of 2007-2008 and most recently the Covid-19 crisis, have a more ambiguous impact on business dynamism and its link to productivity growth. Foster, Grim and Haltiwanger (2014) report evidence for the United States that recessions tend to result in "cleansing", an acceleration in the exit of low-productive firms. This productivity-enhancing reallocation appears to have been more muted during the Great Recession than in previous and milder recessions. According to Riley, Rosazza Bondibene and Young (2014) the "cleansing" that occurred during the Great Recession in the United Kingdom was not sufficient to offset the drop in firm-level productivity. Similar evidence for the recent Covid-19 crisis in the United Kingdom is provided by Bloom et al. (2020). The positive impact on productivity due to the exit of the least productive firms, but also due to the disproportionate impact on low-productivity industries, only partially offsets the negative impact on firm-level productivity of measures to contain Covid-19, that increase intermediate costs. Bloom et al. (2020) also predict negative long-run effects on productivity growth as R&D investment is reduced and CEOs spend much time just dealing with the pandemic.

Kacher and Weiler (2017) show that in the United States – somewhat surprisingly – recessions have sometimes resulted in an increase in the entry rate with the notable exception of the Great Recession. New business formation dropped dramatically from 2007 to 2009. Given the importance of start-ups for industry-level job creation and productivity growth, this may have long-lasting "scarring" effects. The productivity of entrants is generally higher in recessions than in booms. As entrants on average start with a productivity level below the industry average, the apparent higher entry barrier during recessions contributes positively to industry-level productivity growth although this is a short-term effect that is likely nullified by long-term "scarring" effects. During the Great Recession, the average

productivity level of starting firms appears to have been higher than in normal times (Foster, Grim and Haltiwanger 2014; Dumont et al. 2016).

Although theoretical models provide a clear-cut link between business dynamism and productivity growth, which empirical studies tend to confirm, correlation does not imply causation. The decline in both business dynamism and productivity growth may be caused by other factors. Business dynamism may also be an intermediate, rather than the ultimate cause of productivity growth as suggested by the evidence reported by St-Amant and Tessier (2018) who, using data for Canada and the United States, find that productivity appears to cause entry rather than the other way round.

Hopenhayn, Neira and Singhania (2018) use a simple accounting identity that equates the entry rate of firms to the sum of the exit rate and labour force growth, minus average firm size growth, to show that the observed decrease in the entry rate could be explained by the downward trend in labour force growth. Using data for the United States, they find that the decline in labour force growth can account for a third of the decline in firm entry in a direct way. However, if the population growth slowdown results in an ageing firm distribution and the concentration of employment in large firms, through its impact on the exit rate and average firm size, demographical change can account for a larger part of falling entry rates. Karahan, Pugsley and Şahin (2019), also using US data, conclude that demographical changes in the labour force can explain around two-thirds of the decline in the entry rate.

Assuming declining business dynamism is indeed the ultimate cause of the slowdown in productivity growth begs the question of what have been the drivers of this decline. Calvino, Criscuolo and Verlhac (2020) enlist the structural and policy determinants that have so far been put forward as potential explanations of decreased business dynamism: the intensified use of intangibles; the digital transformation; market structure (concentration) and firm heterogeneity; globalisation and integration in global value chains; demographic factors; business regulation; access to finance; innovation policy and human capital. Their cross-country estimations suggest a prominent role of market structure and firm heterogeneity but also of the other structural factors. Regulatory barriers and administrative burdens, weak contract enforcement, financing constraints or inefficient bankruptcy procedures are also found to increase barriers to entry and limit resource reallocation, possibly reinforcing winner-takes-most dynamics. Akcigit and Ates (2021) point at structural and policy factors that hamper the competition between industry leaders and their competitors, and more specifically, the reduced knowledge diffusion from frontier firms to laggard firms, as the key driver of the slowdown in business dynamism in the United States since the 1980s. Akcigit et al. (2021) argue that rising market power, reinforced by mergers and acquisitions involving dominant firms, is probably not the dominant force behind declining business dynamism but has certainly been a contributing factor. Faccio and McConnell (2020), based on long time series for 75 countries, conclude that initial firm size and political connections are the main obstacles to the Schumpeterian process of creative destruction, whereas interlocking directorates and corporate innovation culture have only a modest role. Their results suggest that when large firms are replaced, this is often rather by old small firms than by young firms.

This paper aims at assessing business dynamism and the potential impact on productivity growth in Belgium. Chapter 2 discusses different concepts of enterprises and shows statistics from alternative data sources on business creation and cessation in Belgium. Structural trends as well as the impact of the

Covid-19 crisis are presented and business dynamism in Belgium is compared with other countries. The first section of Chapter 3 reports the results of analyses and estimations based on Belgian firm-level data covering the period 2003-2017. After some descriptive statistics on the relative productivity of entrants and different age groups of firms, the results of tests of the potential causal link between entry, exit and productivity growth, following St-Amant and Tessier (2018), are discussed. The final section of chapter 3 presents the results of a decomposition of productivity growth to estimate the relative contribution of firm entry, firm exit, within-industry reallocation, and firm-level productivity growth to industry-level productivity growth.

2. Business dynamism and productivity growth

This chapter shows evidence on business dynamism in Belgium, comparing levels of firm entry and exit, survival and post-entry growth and within-industry reallocation with other countries and establishing the evolution over time.

2.1. Entry and Exit

There is a wide range of alternative terms for a business unit such as firm, company, enterprise, corporation, establishment, and plant. Although these terms are often used interchangeably, some imply a different concept of what constitutes a business.

The Crossroads Bank for Enterprises (CBE)[1] points out the main distinction in Belgium between a business of sole proprietorship and a company. Sole proprietorship implies that there is no separation between the assets allocated to the professional activity and the private assets of the entrepreneur. It does not require the drafting of articles of association nor a minimum starting capital. The profits of a business with sole proprietorship are subject to personal income taxation. A company, on the other hand, requires the drafting of articles of association and may have a separate legal personality although this is not necessary. A company with legal personality needs to register a deed of incorporation. The main advantage of a company is the separation between the assets of the business and the assets of the entrepreneur. The profits of a company are subject to corporate income taxation. The Crossroads Bank for Enterprises publishes, at the beginning of every month, data on active enterprises.[2] For active enterprises, the data contain information on the juridical situation, the type of enterprise (natural person or legal entity), the juridical form (for legal entities) and the starting date. The starting date for legal entities is the date of the first juridical situation (for example, legal establishment). For a natural person (sole proprietorship) the starting data is the date of beginning of the last period in which the entity has the status of notification or active.

Statbel, the Belgian statistical office, publishes data on new VAT-registered units which comprise all enterprises (natural persons and legal entities) registered in the Crossroads Bank for Enterprises for which the VAT administration has confirmed that they were registered for VAT. Not all enterprises have the obligation of VAT registration.

The CBE data and the Statbel data on VAT-registered units provide information on business creation from an administrative perspective, based on the date of legal establishment or registration. The status 'active' according to the Crossroads Bank for Enterprises data does not necessarily imply that the enterprise has started economic activities and does not provide information on the extent of the economic activities (employment, turnover).

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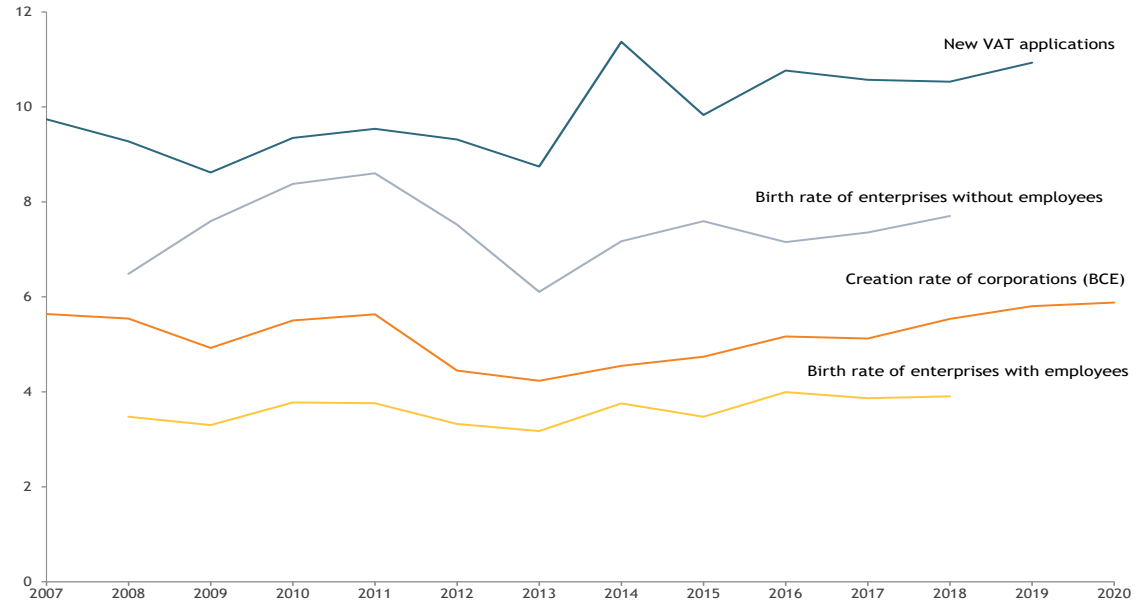
1 The Crossroads Bank for Enterprises is a database owned by the Federal Public Service Economy that contains all basic data on companies and their business units in Belgium.

2 Data on active establishments are also published. An establishment unit is any place that is geographically identifiable by an address, where at least one activity of an enterprise is carried out or from which the activity is carried out. Most enterprises comprise of a single establishment.

Statbel also publishes data on the demography of active enterprises. Active enterprises comprise all businesses with recorded economic activity for at least one day, according to administrative data (social security, VAT, annual accounts). However, for these statistics, VAT registration is not sufficient to be considered as an active enterprise. An enterprise is only considered to be active if it has reported a strictly positive turnover in the VAT declaration. Part of the demography statistics are data on the birth and death of enterprises. Birth is defined as an enterprise active in a given year, but not in the two previous years, and not having been subject to restructuring in the period of up to two years. The death of an enterprise is defined as an enterprise that has been active in a given year, for at least one day, but not in the next two years and not subject to any restructuring in the two years following the last year of activity. The Statbel data on the demography of active enterprises are the source of the Business demography data published by Eurostat for Belgium, which allow for cross-country comparison.

Graph 1 shows the rate of business creation for the period 2007-2020, based on the three different data sources and business concepts that are available for Belgium. Due to methodological reasons and data availability, the rate of business creation cannot be computed for all sources for each year. As there is some delay between legal establishment and actual economic activity, the Statbel data on the start-up (birth) of active enterprises always lag the data on incorporation or VAT registration. Moreover, data on the birth rate of active enterprises are not provided before 2008.[3] The rate of business creation is computed as the share of active businesses that have been established or started activities in that year (according to the business concept that is applicable).

Graph 1 **Business creation in Belgium according to different concepts and sources (2007-2020)**
% active businesses



Source: Statbel: Demography of enterprises in the market sector; VAT-registered businesses (download 6/1/2020), Crossroads Bank for Enterprises (CBE): Open data (download 5/1/2021).

[3] This is due to fact that these data need to comply with Eurostat guidelines. The revised NACE classification (Rev. 2) was implemented in 2008 and all Member States were obliged to provide business demography data starting with the reference year 2008. A Regulation of the European Parliament and of the Council of 11 March 2008 provides a legal basis for data collection on structural business statistics in the European Union. NACE is the European standard classification of productive economic activities.

The rate of creation of enterprises based on the date of incorporation or registration (CBE data) in graph 1 is only computed for private corporations (legal entities) in the Non-financial Corporations Sector[4] (partnerships and associations are excluded). The rate of creation computed for all enterprises in the CBE data is shown in graph 2 for the period 1970-2020.

Statbel data on the demography of active enterprises are provided for different size classes (by employment) which allows for a distinction between enterprises without employees (self-employed) and enterprises with employees. This distinction is important given the tendency of self-employed and liberal professions to create a corporation for tax purposes (difference in rates of personal income taxation and corporate income taxation). The High Council of Finance in Belgium has warned that this tendency may accelerate because of the reduction of corporate income tax rates as of 2018. As the creation of corporations for tax purposes does not reflect any creation of new economic activities, the distinction is important and graph 1 therefore shows start-up rates for zero-employment enterprises as well as for active enterprises with employees.

Graph 1 shows substantial differences in the rate of business creation depending on the data source and business concept. The highest rate is for VAT registrations, which shows a temporary peak in 2014 due to the requirement of VAT registration for lawyers as of that year. As pointed out by Dejardin (2011), a new VAT registration does not always imply the creation of new economic activity, as it can also indicate a change in ownership.

The rate of business creation is the lowest for the concept that is probably most meaningful from an economic perspective, the starting of activities by enterprises with employees. The start-up rate of enterprises without employees is on average twice as high as the start-up rate of enterprises with employees. The rate of creation of enterprises (CBE data), the only variable for which data are available for the entire period, is on average some 40% higher than the start-up rate of enterprises with employees.

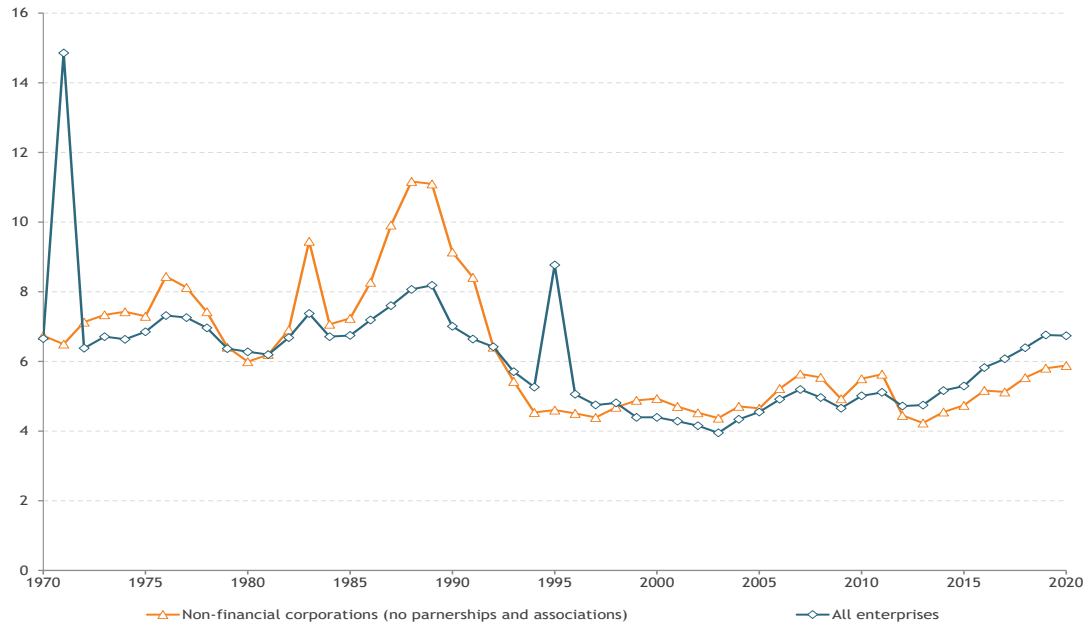
Despite substantial differences in the level of business creation between the four alternative indicators, the evolution between 2007-2020 is rather similar. There is a general downward trend between 2007 and 2013 and an upward trend between 2014 and 2020 although the upward trend is rather muted for the start-up rate of enterprises with employees.

Graph 1, which shows indications of a recent modest increase in business creation, only considers a relatively short period. Graph 2 shows the evolution for the period 1970-2020 based on the CBE data for which longer time series are available. In the graph, the rate of creation is shown for non-financial corporations (as in graph 1) as well as for all enterprises covered by the CBE data. The latter shows some remarkable peaks which can be linked to changes in legislation (for example, the national implementation of the first European Council directive on Company Law of 1968 and the reform of company law in 1995). Both indicators, ignoring the 1971 peak for all enterprises, reveal an overall – if at times capricious – increase in the rate of business creation between 1970 and 1990 and a rather strong drop at the beginning of the 1990s. Afterwards the rate of business creation appears rather stable with an increase at the beginning of the 2000s just before the period considered in graph 1 (2007-2020).

[4] The institutional sector S11 of the National Accounts.

The graph shows that the increase since 2014 is modest and occurs at levels that are well below the average before 1990.

Graph 2 **Rate of creation of enterprises in Belgium (1970-2020)**
% active enterprises



Source: Crossroads Bank for Enterprises: Open data (download 5/1/2021).

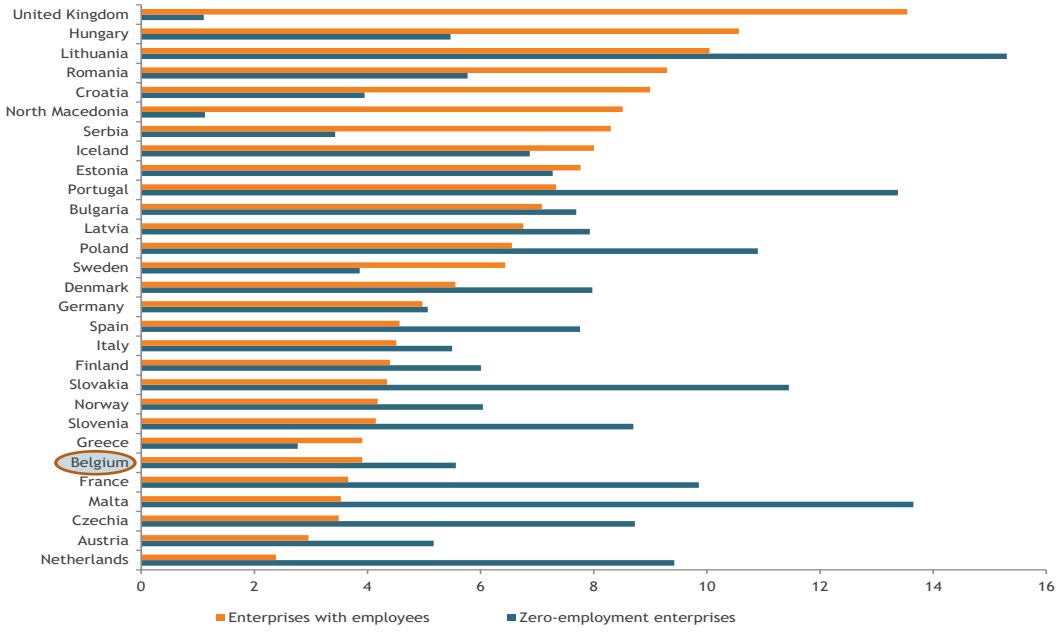
To compare the rate of business creation in Belgium to other countries, following a common business concept, Eurostat provides so-called birth rates.[5] The data for Belgium are published by Statbel as part of the demography of active enterprises statistics. Graph 3 shows the birth rate of enterprises, as in graph 1 distinguishing between zero-employment enterprises and enterprises with employees. Of the 29 countries considered, Belgium has the lowest birth rate of enterprises with employees, except for five other countries. For the birth rate of zero-employment enterprises Belgium ranks 19th. For some countries, the difference in the rate of creation between zero-employment enterprises and enterprises with employees is substantial. In the United Kingdom, which has the highest rate of creation of enterprises with employees, hardly any zero-employment enterprises are created, probably because enterprises below the relatively high VAT threshold are not obliged to be registered (an estimated 750.000 of such enterprises are not included in the UK register). On the other hand, France and the Netherlands, ranked at the bottom for the entry of enterprises with employees, have a high rate of creation of zero-employment enterprises, explained by specific regimes for the self-employed such as "Entreprise Individuelle" in France and "Zelfstandigen zonder personeel (zzp)" in the Netherlands. Sole proprietorships generally do not have the potential or ambition for growth and comparability across countries is hampered by data reporting thresholds in some countries (for example, United Kingdom). The higher entry rate of zero-employment enterprises for Belgium may to some extent be explained by freelance professionals

[5] Eurostat defines the birth of an enterprise as "the creation of a combination of production factors with the restriction that no other enterprises are involved in the event. Births do not include entries into the population due to mergers, break-ups, split-off or restructuring of a set of enterprises. It does not include entries into a sub-population resulting only from a change of activity. A birth occurs when an enterprise starts from scratch and starts activity. An enterprise creation can be considered an enterprise birth if new production factors, in particular new jobs, are created. If a dormant unit is reactivated within two years, this event is not considered a birth."

and self-employed people who create a company to reduce – legally – the taxes on their business, a trend that may have been accelerated by the decline in nominal rates of corporate income taxation (Coppens et al. 2018).

Bento and Restuccia (2019) argue that the reported decline in business dynamism in the United States is due to enterprises without employees that are not considered. When zero-employee enterprises are included in the analysis, they find no indications of declining business dynamism and they conclude that business dynamism cannot explain the slowdown in productivity growth in the United States. Bauer et al. (2020), on the other hand, argue that it is better to exclude zero-employment enterprises from analysis of business dynamism as they believe that these enterprises do not have much potential for high growth or improvement in productivity.

Graph 3 Enterprise birth rate in 29 countries (2018)
% active enterprises



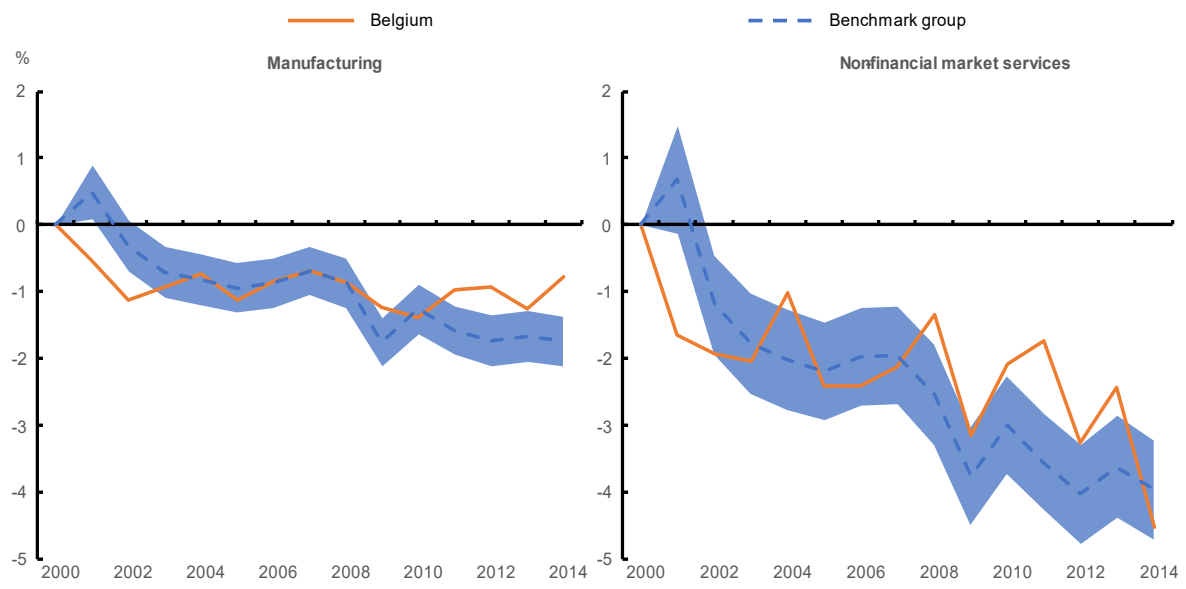
Source: Eurostat, Business demography by size class, Structural Business Statistics. See footnote 5 for definition of the birth of an enterprise.

OECD (2017b) mentions other limitations to the comparability over time and across countries, of statistics on business creation. Countries with an initial low number of enterprises are likely to witness more business creation, as can be seen in graph 3. The creation rate for Central and Eastern European countries is generally higher than for countries that were member of the EU before the 2004 enlargement. If net entry rates are positive, a country with a lower rate of business creation but a higher number of enterprises may still have a higher number of new enterprises than a country with a higher entry rate but smaller population of enterprises.

Belgium participates in the OECD DynEmp project which aims at providing cross-country evidence on the employment dynamics of start-ups and incumbents (Calvino, Criscuolo and Menon 2016; OECD 2017a). In December 2020, the OECD published a Country Note presenting the key findings of DynEmp for Belgium over the period 2000-2014, confirming the low level of business dynamism compared to other countries.

Graph 4 compares the entry rate of Belgium to a benchmark group of countries[6], distinguishing between manufacturing and non-financial market services. The entry rate shown is not the traditional ratio of entrants to the total of active companies, but is the coefficient of year dummies in a regression of the entry rate on a full set of industry-country dummies. The decline in entry is more pronounced in non-financial market services than in manufacturing industries for Belgium[7] as well as for the benchmark group of countries but the decline is rather similar for Belgium and the benchmark group with Belgium witnessing entry below (above) the 95% confidence interval at the beginning (end) of the period considered. One of the main findings of the Dynemp project is that the most dynamic industries – typically the digital-intensive ones – have experienced the largest decline in business dynamism.

Graph 4 Entry rate in Belgium compared to benchmark countries, Manufacturing and Services (2000-2014)



Source: OECD (2020), "Belgium: Business Dynamics", OECD Insights on Productivity and Business Dynamics, December 2020. Note: Entry rates are defined as the number of entering units over the sum of entering and incumbent units. Rates are within industries in Belgium and within country-industry pairs in the set of benchmark countries, taking the first year as the baseline. Plotted are the coefficient estimates of year dummies from a regression of the entry rate on a full set of industry*country dummies. Shaded area is the 95% confidence interval. Regressions are conducted separately for manufacturing and services sectors. The benchmark group of countries for Belgium consists of Austria, Belgium Finland, France, Hungary, Italy, the Netherlands, Norway, Portugal, Spain and Sweden

OECD (2020) points at empirical analysis that identified three types of policies that are correlated with the rate of market entry in Belgium: product market regulation, the efficiency of institutional processes regarding the business environment and access to venture capital.

Bauer et al. (2020) report the average change in entry rates, across two-digit industries in the service sector between 2008 and 2017 for 24 EU countries. Belgium holds the fifth position with a positive, though not statistically significantly different from zero, average change. Of the countries considered, Belgium also has the fifth lowest share of two-digit services with a decline in the entry rate between 2008 and 2017.

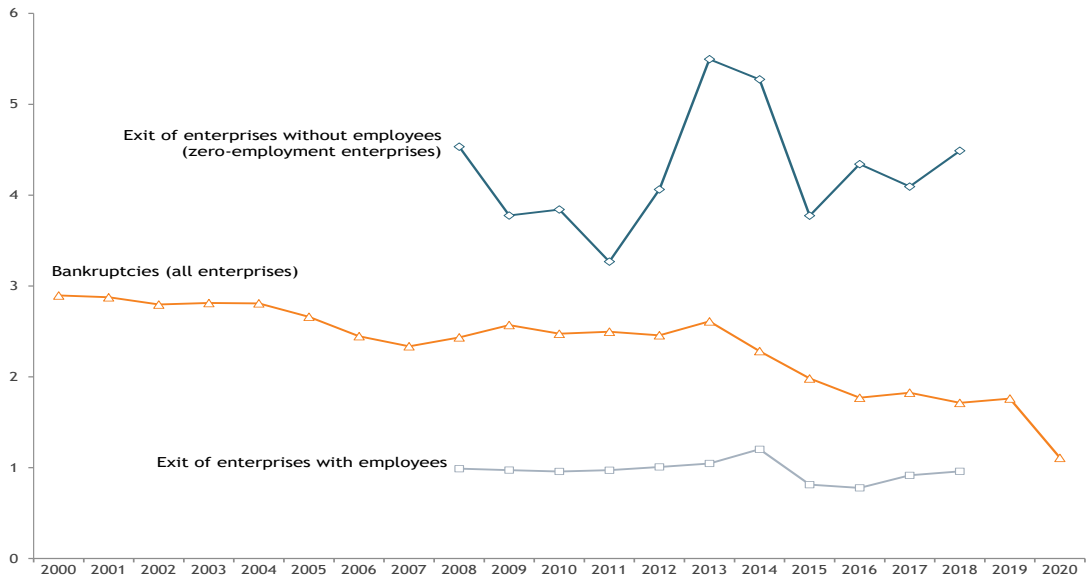
6 The benchmark group of countries for Belgium consists of Austria, Finland, France, Hungary, Italy, the Netherlands, Norway, Portugal, Spain, and Sweden (OECD 2020).

7 Entry rates have decreased by one percentage point in the average manufacturing industry and by four percentage points in services (OECD 2020).

OECD (2019) points at recent evidence that the creation of new enterprises is back to pre-crisis[8] levels in many countries although new entries and job creation appear to take place in industries with below-average productivity levels, and new firms are often smaller. European Commission (2020) confirms that most of the jobs created by new firms emerged in low-productive industries. Since 2006, some countries witness an increase in the shares of jobs being created by new firms in more productive industries. This is also the case for Belgium although the increase is subdued.

The most conspicuous manifestation of reallocation within industries is the exit of enterprises. Graph 5 shows the exit rate of enterprises in Belgium for the period 2000-2020, according to different concepts and sources. Just as for the indicators of business creation, data over the entire period is not available from all data sources. The longest series provides the ratio of bankruptcies to the number of active enterprises. The shorter series provide the so-called death rate, following the definition of Eurostat: "A death amounts to the dissolution of a combination of production factors with the restriction that no other enterprises are involved in the event. Deaths do not include exits from the population due to mergers, take-overs, break-ups or restructuring of a set of enterprises. It does not include exits from a sub-population resulting only from a change of activity. An enterprise is included in the count of deaths only if it is not reactivated within two years. Equally, a reactivation within two years is not counted as a birth."

Graph 5 **Business cessation in Belgium according to different concepts and sources (2000-2020)**
% active enterprises



Source: Number of Bankruptcies and Demography of enterprises in the market sector - Statbel (download 6/1/2020). Crossroads Bank for Enterprises- Open data (download 5/1/2021). Bankruptcies all is computed from the number of bankruptcies reported by Statbel and the number of active enterprises from Crossroads Bank for Enterprises. The two other indicators are the death rate data from the Demography of enterprises (Statbel) broken down between zero-employment enterprises and enterprises with employees.

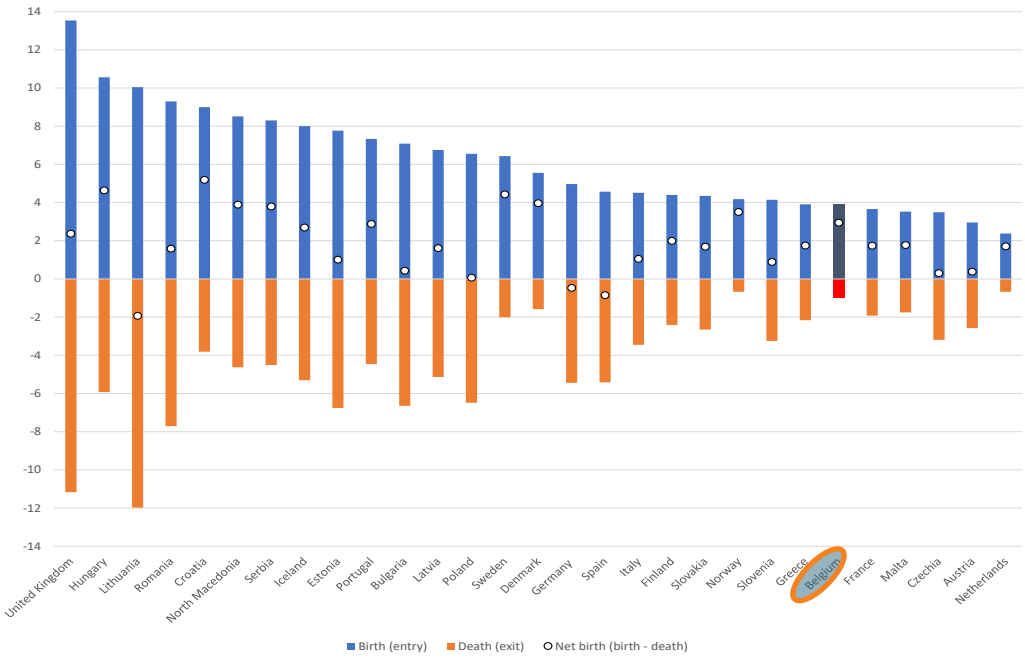
As for the birth rate, graph 5 provides a distinction between zero-employment enterprises and enterprises with employees. The exit of zero-employment enterprises is substantially higher and more erratic, like the birth rate. There is a substantial decline in the bankruptcy rate between 2000 and 2020. The

[8] The global financial crisis of 2007-2008.

strong decrease in bankruptcies in 2020 is discussed in more detail in section 2.4. The exit of enterprises with employees increases between 2008 and 2014, then drops in 2015 to increase again in the three following years, ending up at the level of 2008.

Graph 6 shows the exit rate, in addition to the entry rate, of enterprises for 29 countries in 2018, using Eurostat Business demography statistics. As mentioned before, these statistics use the label birth for entry and death for exit. Enterprise death does not necessarily imply the bankruptcy of an enterprise, voluntary liquidations of corporations are also counted. The upper bars (blue) in graph 6 are the same as, and ranked in the same way, as the orange bars in graph 3. The addition of the death rate (lower orange bars) reveals that birth rates and death rates tend to have similar levels. Countries with high birth rates generally also have high death rates.

Graph 6 **Birth and death rate of enterprises in 29 countries (2018)**
% active enterprises



Source: Eurostat, Business demography by size class, Structural Business Statistics.

The churning rate (birth rate + death rate) is often used as an indicator of business dynamism. The net birth rate (birth rate – death rate) is an alternative indicator that shows the net increase in active enterprises due to entry and exit. This net birth (entry) rate is shown as the black-lined white marker in graph 6. The correlation between the birth rate and the net birth rate is not very high (0.25). Whereas Belgium has one of the lowest birth rates, it has the eight highest net birth rate. As this is to a large extent explained by a very low exit rate, which may indicate that some factors hamper exit, this finding needs to be taken with some caution. The churning rate is sometimes used as an alternative indicator for the process of entry and exit. In 2018, Belgium had the third lowest churning rate of the 29 countries in graph 6.

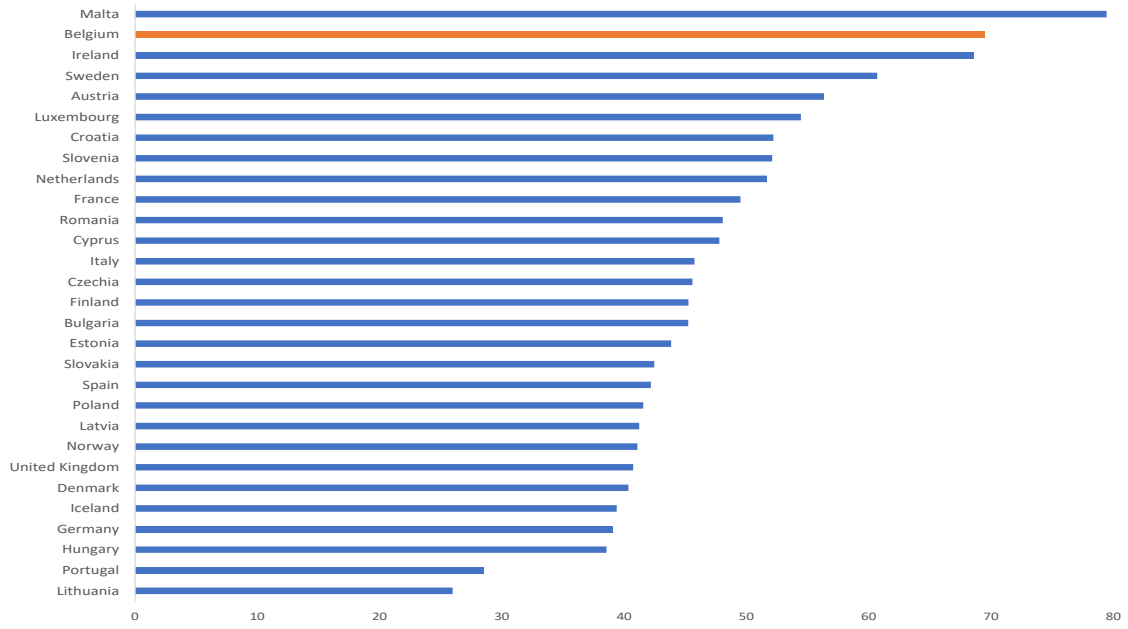
OECD (2018) finds that bankruptcies have declined in nearly all OECD countries in recent years (before the Covid-19 crisis). Graph 5 confirms this conclusion for Belgium.

2.2. Survival and growth

The role of start-ups in business dynamism is not only reflected in the rate of creation of new enterprises but also in the probability of entrants to survive and to grow.

Eurostat Business Demography statistics provide an indicator on the five-year survival rate of entrants, defined as the number of enterprises in the reference year that were "born" five years before and have survived until the reference year, divided by the number of enterprise births five years before. Graph 7 shows the average five-year survival rate of entrants (enterprise births) over the period 2009-2018. With an average survival rate of 69.5%[9], Belgium ranks second, just after Malta.

Graph 7 Five-year survival rate of entrants (average 2009-2018)
%



Source: Eurostat, Business demography by size class, Structural Business Statistics. Number of enterprises in t that entered in t-5 having survived to t, divided by the number of entrants in t-5, average over period 2009-2018.

The survival rate in Belgium was substantially higher at the beginning of the period, with rates above 80%, dropped dramatically in 2014 and continued to decrease, reaching 57.5% in 2018. Despite the strong decrease in the survival rate, Belgium still ranked fourth in 2018.

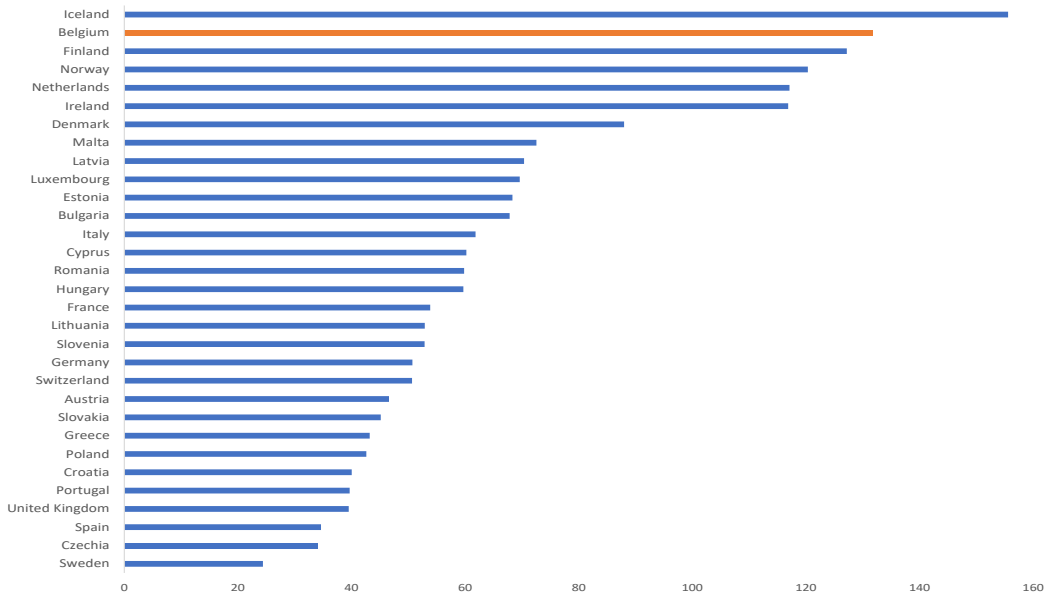
The high survival rate of entrants in Belgium, compared with other countries, is confirmed by the early results of the Dynemp project which show that out of a group of 16 countries Belgium ranks second, after Sweden, in terms of three-year survival of micro start-ups, for the years 2001, 2004 and 2007 (Criscuolo, Gal and Menon 2014).

Graph 8 shows the average growth rate in employment of three-year old entrants over the period 2009-2018. Belgium again ranks high, holding the fourth position. The high growth rate for Belgium is biased by the extremely high, seemingly erroneous, growth of 888% in 2018. Considering the average over the

[9] Average over the years 2011-2018 as no data are available for Belgium for 2009 and 2010.

period 2009-2017, Belgium only ranks 20th. However, the results of the Dynemp project also show the relatively high average employment growth of start-ups in Belgium (Criscuolo, Gal and Menon 2014).

Graph 8 Employment growth rate of three-year old enterprises (average 2009-2018)
%



Source: Eurostat, Business demography by size class, Structural Business Statistics. Number of persons employed in the reference year (t) among enterprises newly born in t-3 having survived to t divided by the number of persons employed in t-3 by the same enterprises, expressed as a percentage growth rate (average growth rate over the period 2009-2018).

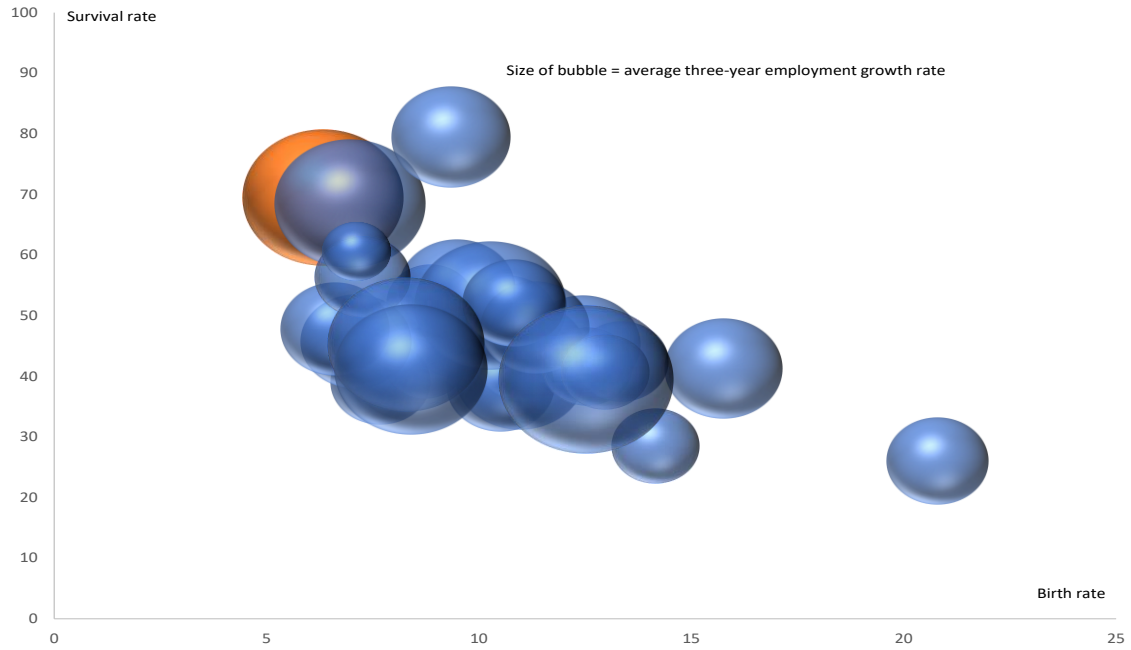
Eurostat Business Demography statistics suggest the existence of a trade-off between different dimensions of start-up dynamics. The rate of business creation is strongly negatively correlated with the five-year survival rate (-0.64) and negatively correlated (-0.17) with the three-year employment growth rate of entrants, though the latter correlation is not statistically significant. Survival and employment growth of entrants is positively correlated but this correlation is also not statistically significant. Graph 9 visually reveals the strong negative correlation between the average birth rate of enterprises over the period 2009-2018 (x-axis) and the average five-year survival rate of entrants (y-axis) over the same period. The bubbles in graph 9 reflect the average three-year employment growth rate over the same period. Belgium (orange bubble) is a clear example of the apparent trade-offs with the lowest average birth rate of all 29 countries considered as well as one of the highest survival and post-entry employment growth rates.

The overall contribution of start-ups to job creation results from the product of the entry rate, average size of entrants[10], the survival rate and post-entry employment growth. Graph 10 compares the net job creation of firms by size and age in Belgium, with a benchmark group of countries based on the results of the Dynemp project. The net job creation by young and small firms[11] is lower, and substantially so in manufacturing, in Belgium than in the benchmark group of countries, resulting from the very low entry rate which is not fully offset by high survival and employment growth of start-ups. On the other hand, old and small firms shed less jobs in Belgium than in the benchmark group of countries. In

10 In the group of Dynemp countries, Belgium is close to the median in terms of average size of entrants.
11 In Belgium almost all startups have less than 250 employees.

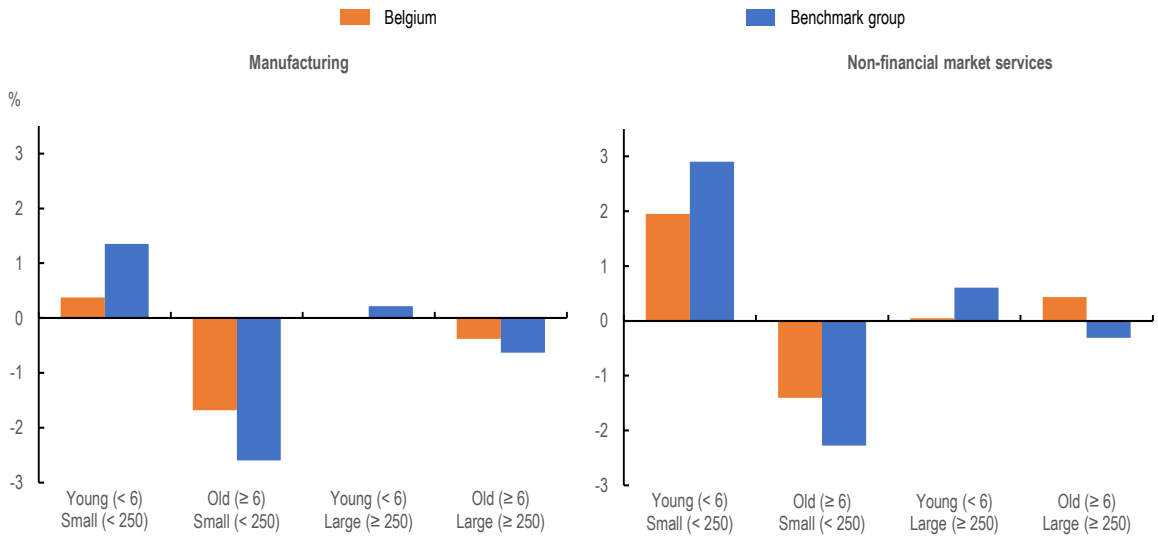
manufacturing industries, net job destruction is clearly explained by jobs lost at old firms, not fully compensated by the job creation of young firms. In market services, old firms also tend to shed jobs but this is offset by higher job creation of start-ups.

Graph 9 Correlation between birth, survival, and growth of enterprises (2009-2018)



Source: Eurostat, Business demography by size class, Structural Business Statistics. The graph shows the correlation between the average birth rate (x-axis) and the average five-year survival rate of entrants (y-axis). The size of the bubbles reflect the average three-year employment growth rate of enterprises. Averages cover the period 2009-2018. The orange bubble is Belgium.

Graph 10 Contribution to net job creation by size and age class, Manufacturing and Services (2000-2014)



Source: OECD (2020), "Belgium: Business Dynamics", OECD Insights on Productivity and Business Dynamics, December 2020. Note: Average contribution to net job creation by size and age class defined as net job creation by the particular group relative to total employment (on average between time t and t−1). The benchmark group of countries for Belgium consists of Austria, Belgium Finland, France, Hungary, Italy, the Netherlands, Norway, Portugal, Spain and Sweden

Whereas in Belgium surviving entrants appear to witness relatively high average growth, the share of young firms that witness high growth, so-called gazelles, is known to be low compared to other

countries. De Mulder, Godefroid and Swartenbroekx (2017) report that in Belgium only about 3% of young enterprises are autonomous[12] gazelles. These young high-growth firms appear to cluster around the port of Antwerp and Brussels National Airport. Firms that experience high growth in the first five years of activity have a higher probability to witness high growth between the sixth and tenth year in business. Gazelles tend to have a larger network of clients and suppliers from the start of their activities, as well as more trade links with the rest of the world.

Bijnens and Konings (2020) use data on private corporations in Belgium to analyse the dispersion and skewness of the distribution of firm growth[13] between 1985 and 2014. Start-up rates began to fall in Belgium in the 1990s (see graph 2) resulting in a smaller employment share of young firms. From 2000 onwards, the probability of small (young as well as old) firms to experience high growth also declined. The authors point out that as the decline in business dynamism is common to most countries, an explanation can probably be found in global factors affecting countries in a similar way but provide preliminary evidence for Belgium that the ICT intensity of industries can be linked to the extent of the decline in business dynamism. Evidence on the role of multinational corporations appears to be more mixed. The presence of multinational corporations is negatively correlated with levels of business dynamism but positively correlated with the trend in dynamism.

Graph 11 confirms that Belgium ranks at the bottom in the EU in terms of the share of active enterprises that witness high employment growth.[14] A potential explanation for the low number of (young) high-growth firms in Belgium may be found in differences between entrepreneurs in growth aspiration.

Schoar (2010) argues that policies that aim to foster entrepreneurship should acknowledge that entrepreneurs are not a homogeneous group of economic agents that are uniformly affected by economic conditions or policy interventions. She defines subsistence entrepreneurs as individuals that start a business to provide subsistence income and transformational entrepreneurs as "entrepreneurs who aim to create large, vibrant businesses that grow much beyond the scope of an individual's subsistence needs and provide jobs and income for others". If subsistence entrepreneurs have no ambition to grow, increasing their number is not likely to increase the number of young high-growth firms.

De Mulder and Godefroid (2016) consider two types of entrepreneurs. Entrepreneurs driven by necessity or opportunity aim at achieving an income sufficient for themselves and their family, or to increase their income. Examples of this type of entrepreneur are the unemployed who start a small business or business executives who set up their own consultancy. Another type of entrepreneur, the growth-driven, aspire to create and develop economic projects that can generate wealth and jobs. Using data from the Global Entrepreneurship Monitor, De Mulder and Godefroid (2016) compare the share of both types of entrepreneurs in early-stage entrepreneurial activity in Belgium with the shares in neighbouring countries. Total early-stage Entrepreneurial Activity[15] in Belgium increased from 3.2% in the pre-

12 That do not belong to a multinational or a Belgian corporate group.

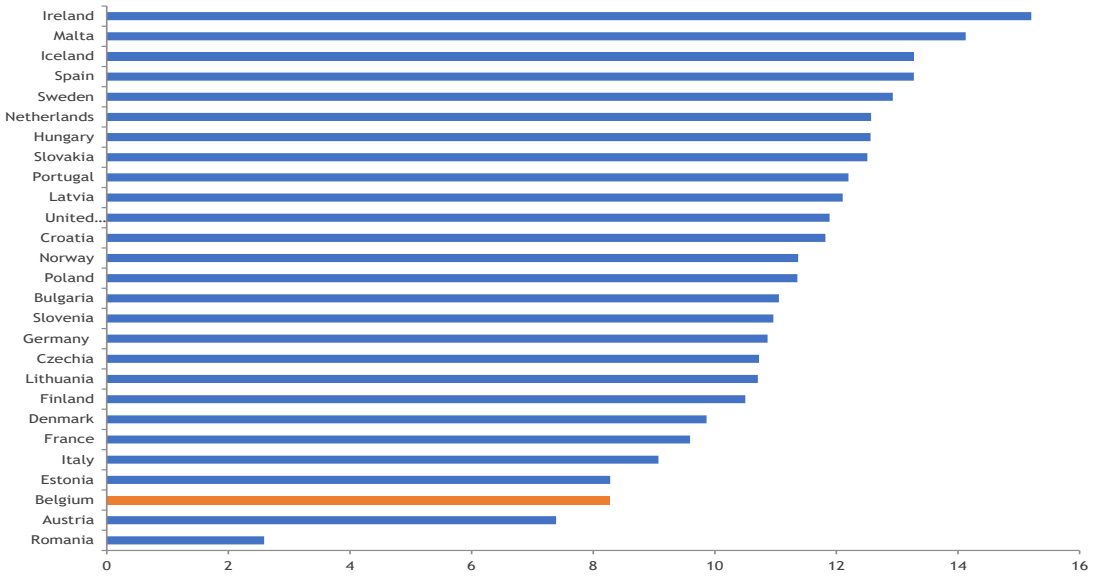
13 Through the difference between the 90th, 50Th and 10Th decile of the firm growth rate distribution.

14 Eurostat defines a high-growth enterprise (growth by 10 % or more) as an enterprise with average annualised growth in number of employees greater than 10 % per year over a three-year period (t – 3 to t) and having at least 10 employees at the beginning of the growth (t – 3).

15 Total early-stage Entrepreneurial Activity (TEA) indicates the proportion of people aged from 18 to 64 years setting up or running a business which is no more than 3 ½ years old.

crisis period (2004-2008) to 4.9% in the years 2009-2015. However, the increase results entirely from necessity-driven or opportunity-driven entrepreneurship.

Graph 11 Share of high-growth enterprises in 27 European Countries (average 2014-2018)
% active enterprises



Source: Eurostat, Business demography, Structural Business Statistics. Share of high-growth enterprises measured as the number of high-growth enterprises, divided by the number of active enterprises with at least 10 employees, average over the period 2014-2018. A high-growth enterprise (growth by 10% or more) is an enterprise with average annualized growth in number of employees greater than 10 % per year over a three-year period (t - 3 to t) and having at least 10 employees in the beginning of the growth (t - 3).

The share of growth-driven entrepreneurs decreased in Belgium between the two periods, contrary to Germany, the Netherlands and the United Kingdom and the EU-15 average. The mere 1.4% share of growth-driven entrepreneurs for the years 2009-2015 in Belgium was below the EU-15 average as well as below the level in the Netherlands and the United Kingdom and slightly higher than in France and Germany. Out of a group of 26 EU countries, reported in European Commission (2020), Belgium ranked 22nd in terms of opportunity-driven entrepreneurship[16] in 2018. Belgium also ranks at the bottom, in the EU-15 countries group, on indicators of entrepreneurship culture, especially for the willingness to start a business and the status of successful entrepreneurs[17] (De Mulder and Godefroid 2016).

Firms can achieve growth internally (often called organically), by expanding their activities as they increase their share in existing markets or create and explore new markets; or externally, through mergers and acquisitions (M&A). If successful or promising start-ups are acquired early on by large incumbents, statistics will underestimate high growth of young businesses. As mentioned in the introduction, Akcigit et al. (2021) consider the surge in M&A by dominant firms as a factor that contributes to the falling share of young firms and decreased dispersion in firm growth. Analysis of data on M&A, by Dumont et al. (2017), shows that high sales growth and intangible assets increase the probability that a Belgian company will be acquired (especially for intra-industry deals or when the acquirer is a foreign

16 The opportunity-driven entrepreneurship index is calculated as the ratio between the share of people involved in improvement-driven entrepreneurship and the share of people involved in necessity-driven entrepreneurship.

17 Denotes the percentage of the population aged between 18 and 64 who agree with the statement that in their country, successful entrepreneurs receive high status.

company) but also that Belgian companies are, relative to companies from other countries, not often involved in M&A deals, as a target or as an acquirer. Belgian young firms are less inclined to acquire firms than foreign young firms to acquire Belgian firms. For the small group of Belgian firms that are active in M&A deals, acquisitions are instrumental in achieving high growth. Firms involved in acquisitions account for a disproportionate share of high-growth firms in Belgium but given the low number involved in M&A deals, they account for less than 5% of high-growth firms. The low involvement of Belgian companies in M&A deals may partially explain the low number of high-growth firms.

Moreno and Coad (2015) point at the mixed empirical evidence on high-growth firms to caution policy makers not to focus too much on high-growth firms. Policies that target specific firms may not be very successful if, as empirical evidence seems to indicate, there are no clear determinants of the emergence and long-term performance of high-growth firms. Brown, Mawson and Mason (2017) argue that policy makers and entrepreneurship scholars have become obsessed with high-growth firms as a result of commonly held myths, for example that these firms are predominantly young, small and active in high-tech industries. Aldrich and Ruef (2018) equally warn that misplaced attention on gazelles and unicorns, rather than on more mundane aspects of start-ups, hampers a policy-relevant perspective on entrepreneurship. Coad, Daunfeldt and Halvarsson (2020) concur with McKelvie and Wiklund (2010) that entrepreneurship research should focus more on the way in which firm grow (analysing growth paths and volatility in growth) than merely on how much firms grow.

2.3. Reallocation

Another indicator of business dynamism is within-industry reallocation between incumbents.[18] As industry-level productivity is the share-weighted sum of the productivity of firms, even if the productivity of all existing firms within an industry remains constant, a reallocation of resources from low-productivity to high-productivity firms can result in an increase in industry-level productivity. In theoretical models of market selection and creative destruction, low-productivity firms are less likely to survive and less likely to expand than more productive firms, resulting in productivity-enhancing expansion and contraction. Decker et al. (2014) show evidence for the United States of a long-term decline (since the 1980s) in gross job flows and within-firm employment volatility.

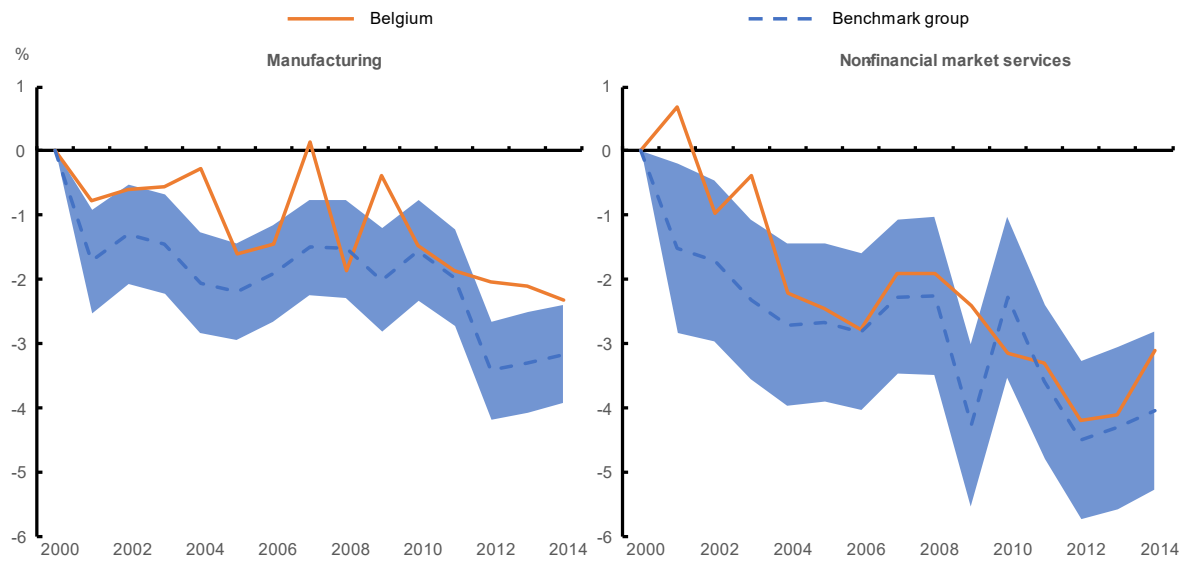
Using results from the Dynemp project, OECD (2020) compares job reallocation between Belgium and a benchmark group of countries for manufacturing and non-financial market services for the period 2000-2014. The decline in job reallocation between 2000 and 2014 has been slightly less pronounced in Belgium (-2% in manufacturing and -3% in services) than in the benchmark group but, just as with entry rates, the level of job reallocation is very low in Belgium (job reallocation rates of incumbent firms in Belgium are about one-third smaller than in the benchmark countries).

Decker et al. (2014) argue that it is difficult to prescribe what the optimal pace of business dynamism should be as this implies balancing the benefits of productivity growth against the costs to firms and workers associated with reallocation.

[18] Entry and exit of firms are the most extreme manifestations of reallocation.

Lentz and Mortensen (2005) propose a theoretical model which, based on the endogenous growth model of Grossman and Helpman (1991), considers the role of reallocation of workers between firms as a source of equilibrium productivity growth. Productive firms (firms that introduced high-quality products) will expand through product diversification but only if the quality of new products depends on the quality of the products the firms has introduced in the past. If the expected quality of future products is identical across firms, investment in R&D, which is the source of higher quality products, is independent of a firm's current productivity.

Graph 12 Job reallocation rates, Manufacturing and Services (2000-2014)



Source: OECD (2020), "Belgium: Business Dynamics", OECD Insights on Productivity and Business Dynamics, December 2020. Note: Job reallocation rates are defined as the sum of job creation and destruction over total employment (on average between time t and t−1). Rates are within industries in Belgium and within country-industry pairs in the set of benchmark countries, taking the first year as the baseline. The shaded area shows the 95% confidence

Lentz and Mortensen (2005) show that the link between the number of employees and labour productivity of firms is ambiguous in the first case and even negative in the second case. The latter result follows from the model assumption that innovations are labour-saving. If quality differences between firms are persistent, more productive firms will witness higher sales growth.

Dhingra and Morrow (2019) show, in a model of imperfect competition with differences between firms in productivity and mark-ups, that the efficiency of resource allocation between firms depends on a trade-off between quantity and product variety. Reallocation of resources towards low-cost firms could be welfare-improving, as it enhances productivity, but reallocation towards firms with higher costs could also be welfare-improving if it preserves product variety. Differences in market power between firms may result in excess entry of low-productivity firms and high-productivity incumbents producing too little. The authors show that differences in market power can also affect the economy-wide trade-off between aggregate quantity and variety which contrasts with conclusions of the seminal model of imperfect competition of Dixit and Stiglitz (1977). In the model proposed by Dhingra and Morrow (2019), which underlines the importance of the elasticity of substitution for allocative efficiency, increasing foreign competition through international integration is always welfare-improving. Behrens et al. (2020) use firm-level data for France and the United Kingdom to quantify the gap between equilibrium

and optimal allocation[19] in a multisector monopolistic competition model with endogenous firm entry and selection, productivity, and mark-ups. They estimate that inefficiencies in the allocation of labour and entry between sectors, as well as inefficient selection and output per firm within sectors, generates welfare losses of about 6%-10% of GDP. Baqa show, in a general model with non-constant returns to scale and endogenous entry and exit that there is a tension between entry and rents. Rents may result from non-constant returns to scale (Ricardian rents) or from markups (monopoly rents). They decompose productivity in technical and allocative efficiency and show that allocative efficiency increases if reallocation raises entry in markets with relatively high external economies (due to love of variety).

It is clear from the above that theoretical models that acknowledge the empirically established variety of market structure and heterogeneity in demand across industries do not necessarily support an unambiguous link between market allocation, productivity growth and welfare. Moreover, long-term implications of short-term productivity-enhancing reallocation should be taken into consideration, such as the potentially negative impact on the incentive to innovate due to rising market concentration that may result from reallocation or the consequences for employment and working conditions.

Acemoglu and Restrepo (2019) point out that the net impact of automation on the demand for labour depends on how the displacement of workers, the rising productivity due to more flexible allocation and the reinstatement of workers through the creation of new tasks weigh against each other. A decomposition of the wage bill in the United States indicates that displacement of workers was higher and reinstatement considerably weaker during the last 30 years than the decades before, as productivity growth slowed down while there was a labour-saving shift in the content of tasks. The authors argue that these results hint at an acceleration of automation and a deceleration in the creation of new tasks but also raises the question why productivity growth was subdued despite automation.[20]

Using establishment-level data for the period 1982–2012, Autor et al. (2020) provide evidence for the Unite States that reallocation of sales and value added between firms resulted in rising market concentration and mark-ups and a decrease in the share of labour in value added, which they explain by the winner-takes-most phenomenon of superstar firms. Industries that have become more concentrated have witnessed more innovation and higher productivity growth, suggesting that reallocation has been productivity-enhancing although the authors consider the possibility that superstar firms initially may have gained market shares by legitimately competing on the merits of their innovations or higher productivity but subsequently may use their market power to erect various barriers to entry.

2.4. Cycles, cleansing and scarring

It seems plausible that the entry and exit of firms and within-industry reallocation is linked to business cycles. Based on US firm-level data for the period 1979-2013, Tian (2018) establishes that the entry of firms tends to be procyclical whereas exit is more countercyclical although the latter result appears to be sensitive to the choice of indicator that is used to determine the business cycle. As mentioned in the

[19] Equilibrium results from maximizing the utility of consumers. Under imperfect competition a planner can do better than the market economy by achieving the equilibrium level using less resources, as the planner does not face consumers' demand functions when determining entry in each sector, whereas firms do. This difference creates distortions in the allocation of labour across sectors. Resource allocation in the market equilibrium is not optimal.

[20] Lane and Saint-Martin (2021) provide a recent review of studies on the impact of Artificial Intelligence on the labour market.

introduction, Kacher and Weiler (2017) report that in the United States recessions have sometimes resulted in an increase in the entry rate, except during the Great Recession, that followed the global financial crisis of 2007-2008, when new business formation fell dramatically.

Koellinger and Thurik (2012) report the results of Granger causality tests for a panel of 22 OECD countries, covering the period 1972-2007. Entrepreneurship, measured as the share of business owners in the total labour force, appears to be a leading indicator of GDP growth and not the other way round. They argue that the results show that entrepreneurs are agents of economic development, in a Schumpeterian sense, who anticipate and trigger economic booms but also that many business owners perform only marginal activities and escape to entrepreneurship only if no regular jobs are available. The latter is confirmed for Belgium by De Mulder and Godefroid (2016) who find that the rise of entrepreneurship in Belgium since the financial crisis can be attributed entirely to necessity-driven or opportunity-driven entrepreneurs as more people set up their own business in times of weak economic growth. Foster et al. (2019) analyse the dynamic relationship between entry and productivity over industry innovation cycles. An increase in the entry of firms is followed, with a lag, by an increase in productivity dispersion and only after a subsequent lag by an increase in productivity growth.

As mentioned in the introduction, there is evidence that recessions tend to accelerate the exit of low-productivity firms, so-called "cleansing" although during the Great Recession within-industry reallocation was apparently more muted than during milder recessions (Foster, Grim and Haltiwanger 2014; Riley, Rosazza Bondibene and Young 2014; Dumont et al. 2016). Bloom et al. (2020) report early evidence of the recent Covid-19 crisis for the United Kingdom. The negative impact on firm-level productivity from measures that aim to contain the Covid-19 pandemic, through increasing costs, is only partially offset by a positive impact on productivity from the exit of low-productive firms and the disproportionate impact on low- productivity industries. As R&D investment is reduced and CEOs spend much time just dealing with the pandemic, the negative effects on productivity growth may be exacerbated in the long run.

In the Unites States in 2020, in contrast with the Great Recession, new business applications rebounded dramatically after an initial decline. There appears to be a shift towards business applications that are likely to be zero-employment businesses, suggesting that the surge in business applications may be necessity-driven rather than growth-driven (see Dinlersoz et al. 2021)

A contentious topic in the recent literature on business dynamism are so-called zombie firms and the potential impact of the current Covid-19 crisis on these firms. Adalet McGowan, Andrews and Millot (2017) defined zombie firms as old firms with persistent problems meeting their interest payments[21]. Their analysis of 13 OECD countries suggests that the number of zombie firms, which tend to have below-average productivity, and their share in resources has risen and that this has hampered productivity growth by limiting the expansion of healthy incumbent firms and by creating barriers to entry and to post-entry growth of young firms. Out of 13 countries considered in the analysis, Belgium is reported to have had the highest share of labour and the third highest share of capital sunk in zombie firms in 2013 (both at 14%). Analysis based on data from the Central Balance Sheet Office indicated that

[21] More precisely firms aged 10 years or older that have an interest coverage ratio (ratio of operating income to interest expenses) below 1 over three consecutive years.

in 2014, zombie firms represented around 10 % of Belgian firms, 12% of employment and 16% of the capital stock. The situation of many of these firms appeared to be persistent as 33% of firms identified as zombies during the 1998-2009 were still in that position five years later (National Bank of Belgium 2018). Using a different definition than Adalet McGowan, Andrews and Millot (2017)[22], Banerjee and Hofman (2020) find that the share of zombie firms increased from 4% in the late 1980s to 15% in 2017, in a group of 14 OECD countries (including Belgium). The persistence of zombie firms has increased over time. Out of the total number of zombie firms that the authors identified since the mid-1980s, some 25% have exited the market by 2017 and around 60% have managed to recover (they are no longer zombie firms). Firms that have recovered from the zombie status tend to underperform, after recovering, compared to firms that have never been zombies and they face a high probability of relapsing into zombie status. The results reported by Banerjee and Hofman (2020) for Belgium indicate that the share of zombie firms decreased since the record high at the beginning of the 2000s.

Laeven, Schepens and Schnabel (2020) notice that the large-scale interventions of governments and central banks in the context of the Covid-19 crisis have sharpened the discussion on zombie firms and more generally on the concern that these measures provide artificial life support for unviable firms. They point at the variety of definitions of zombie firms and argue that the literature tends to focus on crisis-related events when liquidity and solvency issues often become blurred and it is harder to identify zombie firms. According to the authors the scale of the Covid-19 crisis means that many firms that normally would be classified as zombie firms are in fact viable firms[23], that broad-based government intervention is warranted to prevent unnecessary bankruptcies and could be fine-tuned to ensure that money goes as much as possible to viable firms with temporary liquidity constraints. Cros, Épaulard and Martin (2020) report that bankruptcies in France dropped substantially in 2020 but that a sharp increase can be expected in 2021 if solvency issues of viable companies are not tackled and argue that this risk is higher than the risk that unviable firms are unduly kept alive. Gagnon (2020) argues that as many firms operate at a loss when the economy is operating below potential, now is maybe not the best time to escort loss-making firms to the exit and that given the uncertainty surrounding the post-pandemic economy, it is important to keep unprofitable firms afloat in case demand for their products and services rebounds later.[24] Becker and Oehmke (2021) consider the trade-off between inefficient liquidation of viable firms and inefficient continuation of viable firms as a key consideration in the economic policy response to the Covid-19 crisis. They call for an insolvency framework that treats insolvent firms differently depending on their future potential and size. They propose reforms to improve in-court insolvency procedures, facilitate in-court restructuring and reduce reliance on timing for driving liquidation decisions.

Djankov and Zhang (2021) report the change in bankruptcies from 2019 to 2020. Bankruptcies declined in 24 out 25 OECD countries. Belgium witnessed the fifth highest decrease in bankruptcies, after France,

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22 Banerjee and Hofman (2018) show that zombie firms identified based on the criteria suggested by Adalet McGowan, Andrews and Millot (2017) had on average a Tobin's q that is higher than that of non-zombie firms, which may indicate that some of the zombie firms are perceived by financial markets to have a high potential for future profits.

23 If a period of three consecutive years is considered to define firms as zombies, firms that were clearly viable before 2020 would not be labelled as zombie firms.

24 According to Nurmi, Juuso and Matti (2020) firm demographics in Finland, over the period 1999-2017, reveal that zombie-firms, as commonly defined in the literature, are often not truly distressed firms but rather companies with temporarily low revenues relative to interest payments. About a third of these firms are in fact growing companies and two thirds recover from the zombie status to become healthy firms.

Australia, Denmark, and Austria. The authors argue that these numbers probably reflect a calm before the storm and urge governments to start planning for a surge by the end of 2021, through the reform of bankruptcy laws and by reducing the burden on courts.

According to the Belgian Statistical Office Statbel, there were 32% less bankruptcies in Belgium in 2020 than in 2019. This can likely be explained by the financial support provided to firms by the federal and regional governments but even more so by a first moratorium on bankruptcies between 24th April and 17th June 202 and a second moratorium between 6th November 2020 and 31st January 2021. Statbel points out that, in the period between the two moratoriums on bankruptcies, the Federal Public Service Finance and the National Social Security Office did not push for the bankruptcy of firms with overdue payment of taxes or social contributions.

Sedláček and Sterk (2017) show that macroeconomic conditions at the time of creation of firms have long-lasting effects. Evidence for the United States reveals that firms that entered in years with weak job creation tend to remain persistently smaller on average, even when the aggregate economy recovers. This appears to be explained by the smaller size of entrants in weak job creation cohorts rather than by the number of entrants.

Kacher and Weiler (2017) find that the Great Recession had an unprecedented negative impact on start-ups in the United States, with a strong decrease in business creation from 2007 to 2009, and firm exit exceeding entry in 2009 for the first time in decades. The Great Recession also appears to have left lasting scars, especially on the entry of non-zero-employment businesses.

Graph 13 shows the entry and exit rate of enterprises in Belgium for the period 2008-2018, distinguishing between enterprises without employees and enterprises with employees. Of the four series, the entry rate of enterprises with employees has a procyclical correlation of 0.61 with GDP per head of population growth.[25] The entry rate of zero-employee enterprises is also positively correlated with GDP per head of population growth, but this correlation is substantially lower (0.24).[26] The exit rate is countercyclical, with the exit of enterprises with employees again having a negative correlation (-0.14) and the exit of zero-employee enterprises a positive correlation (0.07). The Great Recession does not appear to have had as strong an impact as in the United States on entry and exit in Belgium. The decrease (increase) in the entry (exit) rate of enterprises with employees in the double-dip recession years 2009 and 2012 was rather mild.

The entry (exit) rate of enterprises without employees increased (decreased) in 2009, in line with the apparently more a-cyclical evolution of these enterprises, as reflected by the low correlation with GDP per head of population growth.

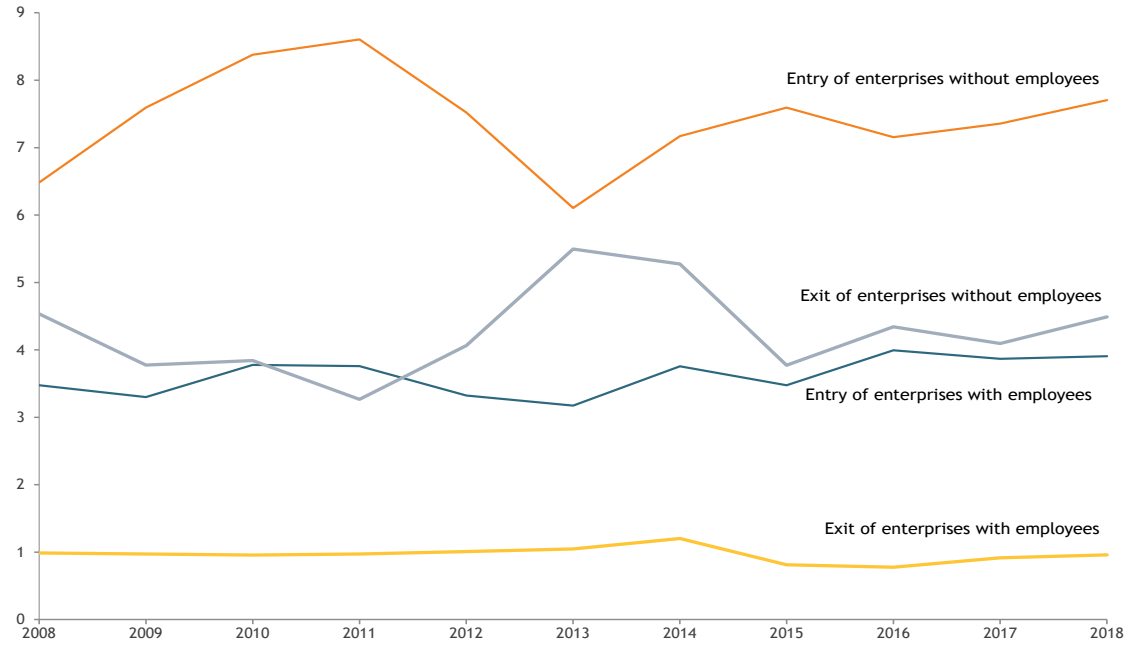
Benedetti Fasil, Sedláček and Sterk (2020) use the EU start-up calculator to predict the negative effects, up to 2030, on aggregate employment, resulting from the impact of Covid-19 on start-ups and young firms. For Belgium, the cumulative employment loss for the period 2020-2030 is predicted to be up to

[25] Data on GDP per head of population are from the Annual macro-economic (AMECO) database of the European Commission.

[26] For the period 2008-2018 the rate of new VAT applications and the creation rate of enterprises (KBO Open Data) are also positively correlated with GDP per capita growth, respectively 0.50 and 0.44. Over the period 1970-2018, the correlation between the creation of enterprises and GDP per capita growth is 0.18.

82.000. If start-up activities were to recover swiftly in 2021, employment loss might be limited to 59.000. About 60% of the aggregate employment loss is accounted for by the reduction of the survival rate, about 30% by the reduction in the number of start-ups and 15% by reduced growth of start-ups. Given the important role of young firms for job creation in services in Belgium, the impact is expected to be more substantial in this sector than in manufacturing industries.

Graph 13 Entry and exit rate of enterprises in Belgium (2008-2018)
% enterprises



Source: Demography of enterprises in the market sector - Statbel.

Topical data on the monthly creation of enterprises in Belgium are available from the Crossroads Bank for Enterprises. Graph 14 compares the rate of creation of enterprises for each month in 2020, to the rate in 2019 and the average rate over the years 2015-2018. The graph also shows the rate of creation for the first three months of 2021. The monthly data permit to assess the impact of the Covid-19 crisis on new business formation. The strongly negative impact on the creation of enterprises can be clearly seen for March until May 2020. Whereas the rate of creation of enterprises was higher in January and February 2020 than in the same months in 2019, it was below the 2019 level and close to the 2015-2018 average in March 2020. The strongest impact can be seen in April, when the rate of creation was 19% lower than in 2019[27] and 33% lower than in 2015-2018.

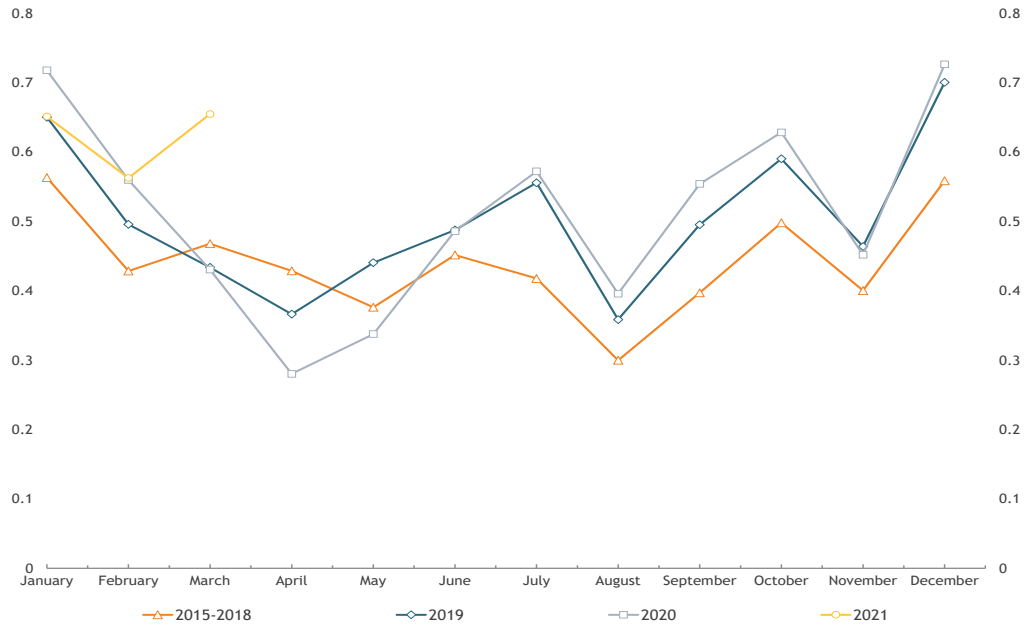
In May 2020, the rate of creation was still below the level of 2019, but the gap was already smaller. More surprisingly, the rate of creation was higher in 2020 from June onwards until the end of the year, except for November when restrictions to curtail the second wave of Covid-19 infections were imposed in Belgium. Between March 2020 – the onset of the Covid-19 crisis in Belgium – and December 2020, about 6% more enterprises were created than in the same period in 2019. In January 2021, the rate of creation was lower than in January 2020, in February 2021 it was similar but in March 2021 the rate of creation

[27] Coincidentally, the rate of creation in pre-Covid 2019 was also lower than the average rate for 2015-2018 in March and April.

of enterprises was substantially higher than in March 2020, than in March 2019 and the average for the period 2015-2018.

The data on the creation of enterprises in graph 14 do not allow for a distinction between zero-employee businesses and enterprises with employees. As mentioned before, the rate of creation of enterprises with employees was highly correlated with GDP per capita growth over the period 2008-2018, which suggests a strong decrease for 2020 although the negative impact of the Great Recession year 2009 was subdued as shown in graph 13.

Graph 14 Monthly rate of creation of enterprises in Belgium (2015-2021)
% active enterprises



Source: Crossroads Bank for Enterprises- Open data (download 6/4/2021). Only non-financial corporations (excluding partnerships and associations) are considered.

The strong increase in zero-employee enterprises in 2009, which seems to support the necessity-driven aspect of start-ups in recessions, may be an indication that this phenomenon also explains the surprisingly high entry rates in 2020 for the months June up to December (cf., US evidence reported by Dinlersoz et al. 2021). It will take until the publication of data on the creation by enterprises with a breakdown by employment to clarify this issue.

Table 1 ranks two-digit industries in increasing order of the growth in business creation between 2020 and 2019, considering the period March-December for both years. Out of 77 industries, 40 witnessed a decrease in the number of enterprises that have been created between 2020 and 2019. The industry-specific impact of the Covid-19 crisis is reflected in the strong decrease in industries such as Travel agency, tour operator and other reservation service and related activities; Residential care activities; Employment activities; Creative, arts and entertainment activities; Food and beverage service activities; Accommodation and some transport activities.

Table 1 Growth in the creation of enterprises by two-digit industry (March-December 2019-2020)
in %

	Industry	Growth 2019-2020
1	Manufacture of motor vehicles, trailers and semi-trailers	-65
2	Gambling and betting activities	-63
3	Travel agency, tour operator and other reservation service and related activities	-59
4	Manufacture of computer, electronic and optical products	-42
5	Insurance, reinsurance and pension funding, except compulsory social security	-42
6	Manufacture of chemicals and chemical products	-39
7	Water transport	-38
8	Public administration and defence; compulsory social security	-33
9	Residential care activities	-33
10	Electricity, gas, steam and air conditioning supply	-32
11	Employment activities	-28
12	Programming and broadcasting activities	-25
13	Creative, arts and entertainment activities	-22
14	Manufacture of tobacco products	-20
15	Food and beverage service activities	-19
16	Land transport and transport via pipelines	-15
17	Accommodation	-13
18	Manufacture of wearing apparel	-12
19	Waste collection, treatment and disposal activities; materials recovery	-12
20	Other professional, scientific and technical activities	-12
21	Social work activities without accommodation	-12
22	Manufacture of fabricated metal products, except machinery and equipment	-11
23	Manufacture of electrical equipment	-10
24	Manufacture of basic pharmaceutical products and pharmaceutical preparations	-10
25	Human health activities	-9
26	Computer programming, consultancy and related activities	-9
27	Manufacture of basic metals	-9
28	Publishing activities	-9
29	Activities auxiliary to financial services and insurance activities	-8
30	Motion picture, video and television programme production, sound recording and music publishing activities	-8
31	Air transport	-8
32	Architectural and engineering activities; technical testing and analysis	-5
33	Other personal service activities	-5
34	Sports activities and amusement and recreation activities	-5
35	Office administrative, office support and other business support activities	-4
36	Real estate activities	-4
37	Manufacture of leather and related products	-3
38	Financial service activities, except insurance and pension funding	-3
39	Repair and installation of machinery and equipment	-3
40	Activities of head offices; management consultancy activities	-2
41	Scientific research and development	0
42	Rental and leasing activities	0
43	Activities of households as employers of domestic personnel	0

	Industry	Growth 2019-2020
44	Warehousing and support activities for transportation	2
45	Legal and accounting activities	3
46	Manufacture of food products	4
47	Manufacture of beverages	4
48	Wholesale and retail trade and repair of motor vehicles and motorcycles	6
49	Printing and reproduction of recorded media	7
50	Education	9
51	Security and investigation activities	10
52	Repair of computers and personal and household goods	11
53	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	12
54	Specialised construction activities	12
55	Manufacture of other transport equipment	13
56	Wholesale trade, except of motor vehicles and motorcycles	13
57	Information service activities	14
58	Manufacture of textiles	14
59	Activities of membership organisations	14
60	Retail trade, except of motor vehicles and motorcycles	19
61	Manufacture of rubber and plastic products	20
62	Advertising and market research	20
63	Postal and courier activities	24
64	Construction of buildings	25
65	Services to buildings and landscape activities	26
66	Other manufacturing	27
67	Manufacture of machinery and equipment n.e.c.	39
68	Remediation activities and other waste management services	40
69	Civil engineering	43
70	Manufacture of furniture	49
71	Veterinary activities	54
72	Manufacture of other non-metallic mineral products	59
73	Libraries, archives, museums and other cultural activities	67
74	Manufacture of paper and paper products	100
75	Water collection, treatment and supply	100
76	Telecommunications	153
77	Sewerage	500

Note: The table ranks two-digit industries in increasing order of the growth in corporations that have been created in the period March-December 2020 relative to the period March-December 2019. Source: own computations based on Crossroads Bank for Enterprises- Open data (download 8/3/2021). Only non-financial corporations (excluding partnerships and associations) for which the NACE two-digit code of start-ups is available, are considered.

Some manufacturing industries also appear to have witnessed a substantial loss in the creation of enterprises, such as Manufacture of motor vehicles, trailers, and semi-trailers; Manufacture of computer, electronic and optical products and Manufacture of chemicals and chemical products but this is probably explained more by structural factors than by an impact of Covid-19. There are also some industries that witnessed an increase in the creation of enterprises despite Covid-19 or for some due to shifting activities, teleworking and the acceleration of the digital shift that occurred, such as

Telecommunications; Manufacture of furniture; Services to buildings and landscape activities; Postal and courier activities; Information service activities and Repair of computers and personal and household goods.

There are also some industries with a strong increase in the creation of enterprises between 2020 and 2019 that is probably linked to more structural factors, such as environmental issues, as reflected in the strong increase in Sewerage; Water collection, treatment and supply and Remediation activities and other waste management services.

Graph 15 shows the evolution of the number of bankruptcies for each month of 2019 and 20202 and the first three months of 2021. As can be seen, the number of bankruptcies dropped substantially during the first lockdown in Belgium in 2020, especially in April and May, and remained below the 2019 level for the rest of the year. Only in August 2020 was the number of bankruptcies relatively close to the 2019 level.

Graph 15 Monthly number of bankruptcies (2019-2021)

Source: Statbel, Bankruptcies on a monthly basis (Update 15/4/2021).

There were also far less bankruptcies in the first three months of 2021 than in 2019 or 2020. The low number of bankruptcies since March 2020 can be explained by a first moratorium on bankruptcies from April until mid-June 2020 and a second moratorium from November until the end of January 2021, by limited activities of business courts and registries and by administrations that spare enterprises the initiation of bankruptcy procedures because of overdue taxes and social contributions. In 2021, the federal government implemented a reform to make the access to the procedure for judicial reorganisation more flexible.[28] In 2020 there were some 30% less bankruptcies than in 2019. In March 2021, there were 31% less bankruptcies than in March 2020 and 37% less bankruptcies than in March 2019. The sectors with

[28] See https://statbel.fgov.be/en/themes/enterprises/bankruptcy-statistic/bankruptcies-monthly-basis.

the highest numbers of bankruptcies in March 2021 were transportation and other service activities, construction, wholesale and retail trade and accommodation and food service activities.

In February 2021, Statbel, the Belgian statistical office, reported a record of de-registrations from the VAT register in December 2020, with an increase of +30.7% compared to December 2019. Compared to December 2019, the population of VAT-registered enterprises however further increased by 4%, due to new registrations. However, in January 2021, first VAT registrations also decreased for all sectors, by 5.7% compared to January 2020. Re-registrations decreased by 14.1% compared to 2020 and de-registrations continued to increase, by 3.1%. Given the increase in VAT registrations in 2020, there were still 38,711 more VAT registered units in January 2021 than in January 2020 (a 3.8% increase).

3. Business dynamism and productivity growth in Belgium (2003-2017)

This chapter shows the results of a decomposition of productivity growth in Belgium for the period 2003-2017.[29] Section 3.1 discusses data issues and reports some descriptive statistics. Section 3.2 reports the results of the decomposition in which incumbents are broken down into three age groups (start-ups, young firms and mature firms).

3.1. Data and preliminary analysis

For the analysis of business dynamism and productivity in this paper, Belgian firm-level data from different sources are used. The main source is the annual accounts that most legal entities in Belgium are obliged to deposit at the Central Balance Sheet Office Data. Depending on the size of a corporation, currently three different models of annual account exist: the full model, the abbreviated model, and the micro model. Companies that can deposit an annual account following the abbreviated or micro model do not have to report some variables that are required in the full model. The main variables for the analysis in this paper that are not required in the abbreviated model and the micro model are the variables reflecting output (value added and turnover). For the decomposition of productivity growth, it is important to cover as much of the population of active enterprises as possible. For small companies, for which value added and turnover is not available, other sources can be used such as VAT statements. These sources also provide information on the turnover for some companies that do not deposit an annual account (for start-ups there is a delay in the depositing of the first annual account). For employment, several sources are used such as data from the National Social Security Office or the annual accounts. Combining different sources assures the optimal coverage of the population of active companies. For the analysis only non-financial corporations are considered, excluding partnerships and associations as well as zero-employee corporations. In some industries of the market economy, self-employed entrepreneurs play an important role but no reliable data is available on this category of enterprises to estimate productivity.

The measure of productivity considered for decomposition is Multi Factor Productivity (MFP)[30]. MFP, defined as the part of the output level that is not explained by the level of the production factors used to generate the output, is considered as an indicator of the technical efficiency of production and MFP growth as a proxy of technological change. Starting from a multiplicative production function, taking the logarithm, MFP can be derived as the residual of a regression of value added on labour and capital. Alternatively, MFP can also be estimated from a gross output perspective, regressing gross output on capital, labour, and intermediate inputs.

[29] As the decomposition considers productivity growth, the first year is actually 2002 but this year is not included in the analysis.

[30] Multi factor productivity (MFP) is often called Total Factor Productivity (TFP) as it is supposed to provide an indication of productivity that considers all the inputs used to produce. As some inputs (such as the skills and experience of employees and management) are mostly not observed or considered in the estimation, MFP acknowledges that not all relevant factors are included in the estimation.

The estimation of MFP is fraught with well-known measurement issues and econometric limitations (see, for example, Hulten 2000; Baqaee and Farhi 2019). In a seminal paper, Marschak and Andrews (1944) pointed out two econometric issue that are still topical and to some extent not yet solved in a fully satisfactory manner: the problem of simultaneity or endogeneity (so-called transmission bias) and price heterogeneity within industries. The transmission bias received most attention. If a producer chooses the level of inputs in function of productivity shocks that are not observed by the econometrician, the level of flexible inputs (such as labour) will be endogenous, which may result in biased estimates if not accounted for. The prevalent approach to tackle the transmission bias is through dynamic panel estimation or through control function (proxy variable) estimation. Griliches and Mairesse (1995) argued that in trying to avoid a simultaneity bias in the estimation of productivity, researchers started using "thinner and thinner slices of data, exacerbating other problems and misspecifications". The critique of Griliches and Mairesse mainly aimed at the dynamic panel approach using Generalized Method of Moments (GMM) but they also pointed out the strong assumptions in the control function approach, which had just been introduced by Olley and Pakes (1992)[31].

Griliches and Mairesse (1995) noticed that the second issue mentioned by Marschak and Andrews (1944), price heterogeneity, was largely ignored by researchers. Information on the quantity (volume) of output is often not available in firm-level data sources. Nominal sales or value added are therefore generally deflated by a common industry-level price index, under the assumption that the law of one price holds. If prices are heterogeneous within industries, the use of a common deflator will result in biased estimates of productivity. Prices of producers in the same industry may differ because of unobserved differences in quality or because sales can be generated from different products.[32] Foster, Haltiwanger and Syverson (2008) provide evidence for US Manufacturers that deflating firm-level output by industry-level output price indices, results in the underestimation of the technical efficiency of young firms, as these tend to charge lower prices than incumbents to attract clients. Verschelde et al. (2014), using data from the Belgian PRODCOM survey to construct firm-level output price indices for a subgroup of industries, also find indications that the use of industry-level price deflators tends to result in the overestimation of technical efficiency of older firms relative to young firms. Klette and Griliches (1996) suggested adding industry-level output as a control variable in the estimation of productivity to account for the demand side of product markets. Alternative approaches which receive increasing attention are the explicit modelling of market demand (for example, De Loecker 2011) or the estimation of multi-product functions using detailed product-level information (for example, Dhyne et al. 2014 who use Belgian PRODCOM data).

In addition to heterogeneity in output prices, input prices may also differ between firms. Using a common deflator for capital may also result in biased estimates. In addition, capital is notoriously difficult to measure at the firm level, as pointed out by Bartelsman and Doms (2000), due to composition effects and required time series of investment. Although labour is generally measured in quantity (head count, FTE or hours worked), avoiding the need of deflation, differences in skills and experience go unaccounted for in most estimations due to a lack of data.

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31 The working paper of 1992 was published in Econometrica in 1996.

32 Industries are only homogenous in terms of products in input-output tables, a level that is often not feasible to consider in estimations due to insufficient observations.

As detailed product-level price data is only available for a limited number of industries, within-industry price heterogeneity is not accounted for in the estimation of MFP used for the decomposition of MFP growth in this paper as it includes all relevant industries, especially also market services. This is prompted by a lack of sufficient data and not by the understating of price heterogeneity. Indeed, as shown by Ornaghi (2006), using common industry-level deflators results in a substantial downward bias of scale estimates, mainly due to a lower estimate of the labour coefficient. As methods used to account for the endogeneity bias try to reduce the overestimation of the labour coefficient and underestimation of the capital coefficient, accounting for endogeneity but not for price heterogeneity may result in a larger (downward) bias than not accounting for both. As a result, traditional OLS estimates may be less biased than estimations that try to reduce the transmission bias but ignore price heterogeneity. When applying the control function approach proposed by Olley and Pakes (1992) to their data, Griliches and Mairesse (1995) find that the coefficients move in the wrong direction (the coefficient of labour increases and the coefficient of capital decreases).

Fuss and Theodorakopoulos (2018) argue that the diverging conclusions of different decomposition studies may result from biases in firm-level productivity estimate, for example due to unacknowledged within-industry price heterogeneity, that are mechanically transmitted to aggregate productivity measures. They also point out that components from a decomposition can mask heterogeneity induced by various attributes of the firm. Considering the international trade status of Belgian firms for the period 1998-2012, they find that in manufacturing industries, large incumbent firms that import as well as export determine the evolution of aggregate productivity. Although average productivity growth outweighs the decline in reallocation (covariance between market shares and productivity), the latter seems to indicate an increase in resource misallocation due to market distortions which intensified after the 2008 financial crisis.

Unfortunately, for the decomposition in this paper information on the international trade status is not available. Instead, the age of firms is used as a potentially important attribute of heterogeneity that can be concealed by aggregate components.

Panel estimation (fixed effects) estimation was proposed as an early potential solution to the endogeneity problem, under the assumption that the misspecification that is transmitted to a producer's decisions with respect to production factors is stable over time, or at least does not change much over the period of observation. Griliches and Mairesse (1995) stated that fixed effects estimates of firm-level data tend to produce rather unsatisfactory results, with a low and often statistically nonsignificant coefficient for capital and unreasonable low estimates of return to scale. They argue that fixed effects estimation may either not do enough to tackle endogeneity or too much, by exacerbating measurement errors. Other scholars also pointed out the poor performance of fixed effects estimation (for example, Ackerberg et al. 2007).

The limitations of traditional approaches to tackle endogeneity, such as fixed effects and instrumental variables estimation, are well-reported. However, scholars increasingly point at unresolved identification problems, numerical challenges, and counterfactual assumptions, of the control function approach (Gandhi, Navarro and Rivers 2011, 2020; Collard-Wexler and De Loecker 2016; Rovigatti and Mollisi 2018; Shenoy 2020).

In this paper two alternative estimations of MFP are considered: pooled OLS and a control function estimation following Wooldridge (2009). Year dummies are included to capture business cycle effects and year-specific shocks.

Estimation of MFP using a control function approach as proposed by Wooldridge (2009)[33] results in rather unreliable estimates[34] and using the estimation procedure of Gandhi et al. (2020) in a lack of convergence.

The OLS estimates come with the caveat of a potential endogeneity bias but also of other biases such as output and input price heterogeneity. As these biases may have opposite signs, it is not clear that in absence of an estimation that satisfactorily tackles all biases, a simple OLS estimation results in a lower overall bias than estimations that only tackle one bias but may exacerbate measurement errors or misspecification. The Wooldridge estimates, though supposedly tackling the endogeneity (transmission) bias, come with the caveat that the estimated coefficients of the production function do not appear to be very reliable, with capital coefficients well below the OLS estimates and suggestion of decreasing returns to scale in almost all industries.

MFP can be estimated using either value added or gross output as output variable. When using value added for output, capital and labour are considered as input factors whereas when using gross output, intermediate inputs (purchased (raw) goods and services) are also considered. Most estimations of MFP with firm-level data adopt a value-added perspective although recently gross output estimation gains popularity, for instance to investigate the role of outsourcing and offshoring (Gandhi, Navarro and Rivers 2020). As pointed out by Bartelsman and Doms (2000), shifts in the relative use of intermediate inputs over time may bias productivity measured with value added as output variable. Gandhi, Navarro and Rivers (2017) show that estimation of productivity using gross output may result in substantially different policy conclusions than estimation using value added. They find that using value added results in larger dispersion of productivity than using gross output and that OLS estimation substantially overestimates the output elasticity of intermediate inputs in a gross output setting. The graphs in Annex 2 confirms that OLS estimation results in less dispersion of productivity when using gross output instead of value added. The role of outsourcing, offshoring and more generally the position of companies in global value chains is very relevant for analysis as well as for policy. However, adding

[33] Wooldridge (2009) showed that the joint estimation of the two-equation system to control for unobserved productivity (transmission bias) as proposed by Olley and Pakes (1996) and Levinsohn and Petrin (2003) provides straightforward inference and more efficient estimators.

[34] Estimation of MFP (value added) at the two-digit industry level, following Wooldridge (2009), using the Stata procedure 'prodest' created by Rovigatti and Mollisi (2018), results in very low estimates of both the capital and labour coefficient and decreasing returns to scale in all industries. The coefficient for capital is generally lower in the control function estimation than in the pooled OLS. This seems reminiscent of the finding by Grliches and Mairesse (1995) who found that when applying the control function approach proposed by Olley and Pakes (1992), to their data, the capital coefficient decreased although the estimation is supposed to tackle the underestimation of the capital coefficient due to the endogeneity bias of OLS estimation. Somewhat ironically, recent solutions to reported limitations of the control function approach (Rovigatti and Mollisi 2018; Gandhi, Navarro and Rivers 2020), consist in (hybrid) forms of dynamic panel and GMM estimation, which was at the core of the Griliches and Mairesse (1995) critique of using "thinner and thinner slices of data, exacerbating other problems and misspecifications". A potential explanation for the low capital coefficient in the control function estimation may be the bias due to measurement error in capital. Collard-Wexler and De Loecker (2016) find that measurement error in capital results in a substantial downward bias of the capital coefficient. However, in their Monte Carlo simulations the downward bias of the capital coefficient is substantially larger for OLS and fixed effects than for the control function estimation that does not account for measurement error in capital, which does not explain the fact that the Pooled OLS estimate of the capital coefficient is much larger than in the control function (Wooldridge) estimation.

intermediate inputs to the estimation may exacerbate measurement error and unobserved heterogeneity in input prices (Morlacco 2020 provides evidence of substantial purchasing power in intermediate inputs of French importers). The use of an industry-level deflator for intermediate inputs may be even more problematic than for capital. The choice between value added and gross output is therefore not straightforward (see Hall, Mairesse and Mohnen 2009).

Annex 2 shows the distribution of MFP in 2017 for pooled OLS estimation and for control function estimation following Wooldridge (2009). The graph compares the distribution of MFP using value added for output to MFP using gross output for output. The dispersion of MFP resulting from pooled OLS is smaller when using gross output than value added as output indicator, in line with Gandhi, Navarro and Rivers (2017). This is not the case for the Wooldridge MFP estimation for which dispersion is larger when using gross output than value added. The difference in the distribution of MFP is more substantial for the Wooldridge estimation than for the pooled OLS estimation. This may be explained by the identification issues in the gross output function pointed out by Gandhi, Navarro and Rivers (2020). Gandhi, Navarro and Rivers (2020) show that, in a gross output context, OLS overestimates the elasticity of intermediate inputs, underestimates the elasticity of capital and labour, and tends to understate productivity heterogeneity.

The number of Full-Time Equivalent (FTE) employees is used for labour. Dumont and Kegels (2016) have shown that as the FTE ratio (FTE number of employees/total number of employees) of firms increases with firm age in Belgium, using a simple head count results in the underestimation of the productivity of entrants and young firms and an overestimation of the dispersion of productivity. A breakdown of labour by level of education or by occupation would allow to account for skill heterogeneity among workers but unfortunately only partial information is available at the firm level and is therefore not considered for estimation.

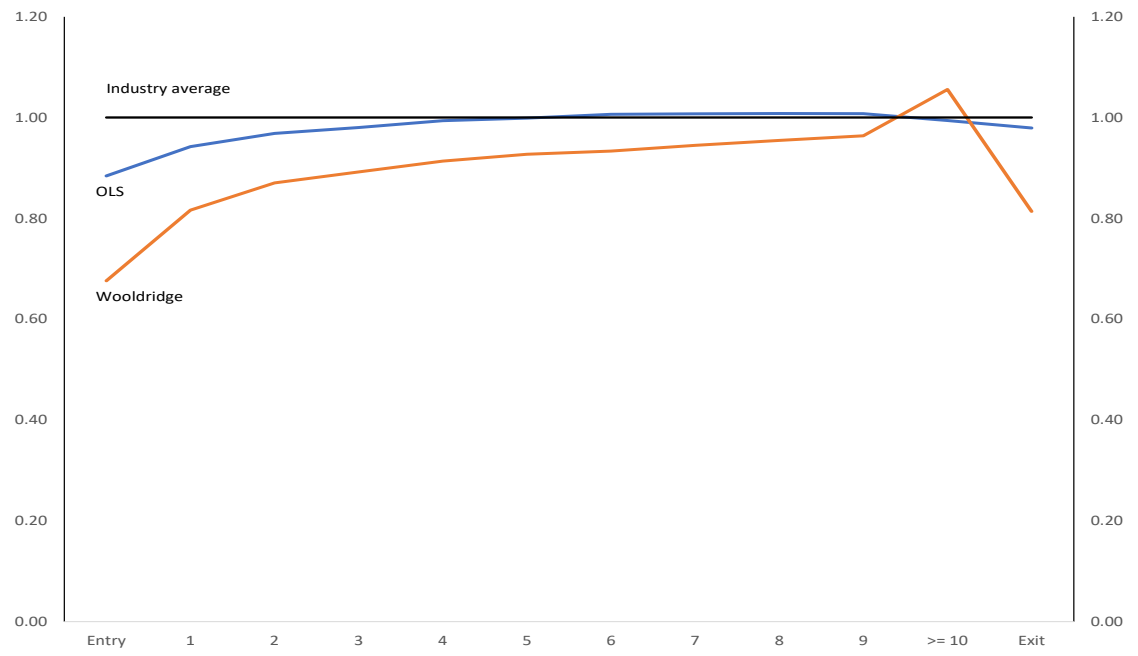
For capital, the book value of tangible and intangible fixed assets is considered. Tangible fixed assets consist of Land and buildings; Plant, machinery, and equipment; Furniture and vehicles; Leasing and other similar rights; Other tangible fixed assets and Assets under construction and advance payments. Intangible fixed assets consist of Research and development costs; Concessions, patents licenses, know-how, brands, and similar rights; Goodwill and advance payments. Intangible assets are often not considered in the estimation of productivity despite their increasing importance (see Haskel and Westlake 2017). The book value of assets in the annual account of firms does not necessarily reflect the economic value as it is subject to accounting principles (for example, depreciation rules).[35] The valuation of intangible assets is even more problematic than for tangible assets. Data on investment that permit to construct capital stocks or compute capital services that better reflect the contribution of capital to output are often lacking. For Belgium, this information is only available for a relatively small group of large firms.

Value added, gross output, capital and intermediate inputs are expressed in real value, using two-digit industry price deflators from the OECD STAN database. As pointed out before, the use of common industry-level deflators is a potential source of substantial bias in the estimation of productivity as it ignores within-industry price heterogeneity.

[35] Collard-Wexler and De Loecker (2016) provide an overview of potential measurement errors in capital.

Firms that enter an industry generally start with a productivity level below the industry average so that they tend to have a negative contribution to industry-level productivity. Productivity of surviving start-ups increases with age as can be seen in graph 16 which shows average Multi Factor Productivity, relative to the two-digit industry average, for MFP from a pooled OLS estimation and for MFP from a Wooldridge estimation (both averaged over value added and gross output estimates) for entrants and by age. Age >=10 considers all incumbents that are active for at least 10 years but excluding firms that exit the next year. The exit group shows relative productivity of firms in year t of firms active in year t but no longer active in year t+1.

Graph 16 Multi Factor Productivity, relative to the industry average, by firm age (2003-2017)
Average productivity relative to two-digit industry average

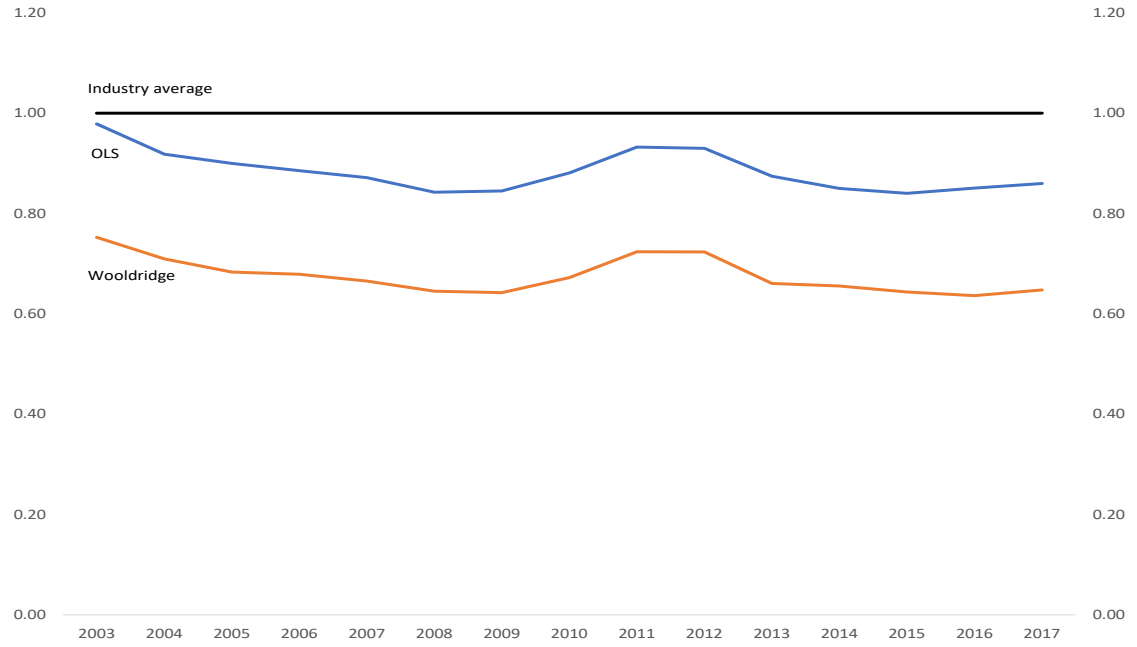


Note: The blue line shows the average across two-digit industries and years of multi factor productivity (MFP) from pooled OLS estimation (value added and gross output) relative to the two-digit industry average by age (industry average=1). The orange line shows the average of relative MFP from a control function estimation (Wooldrige), averaged over value added and gross output estimates. The group age>=10 considers all incumbents that had been active for 10 years or more. The group exit considers firms that were active in year t but no longer active in year t+1.

Both MFP estimates show the below-average productivity of entrants and the gradual increase in productivity in the years after entry. The initial relative productivity of entrants and start-ups is substantially lower for Wooldridge MFP than for OLS MFP. Whereas, according to the OLS estimate, it takes entrants about four to five years to catch up with the industry average, Wooldridge estimates suggest that it takes much longer (10 years or more). Both MFP estimates agree that firms that exit in the next year have below-average productivity in the year before exit although the relative productivity is substantially lower when using Wooldridge MFP estimates.

Graph 17 shows the evolution of relative Multi Factor Productivity of entrants over the period 2003-2017 for OLS MFP estimates and Wooldridge MFP estimates (averaged over value added and gross output estimates for both). Relative MFP is computed, for each year, with respect to the two-digit industry average. Despite the substantial difference in level, both estimates reveal a similar decline in the productivity of entrants relative to the industry average.

Graph 17 Evolution of relative Multi Factor Productivity of entrants (2003-2017)
Average productivity relative to two-digit industry average (industry average = 1)



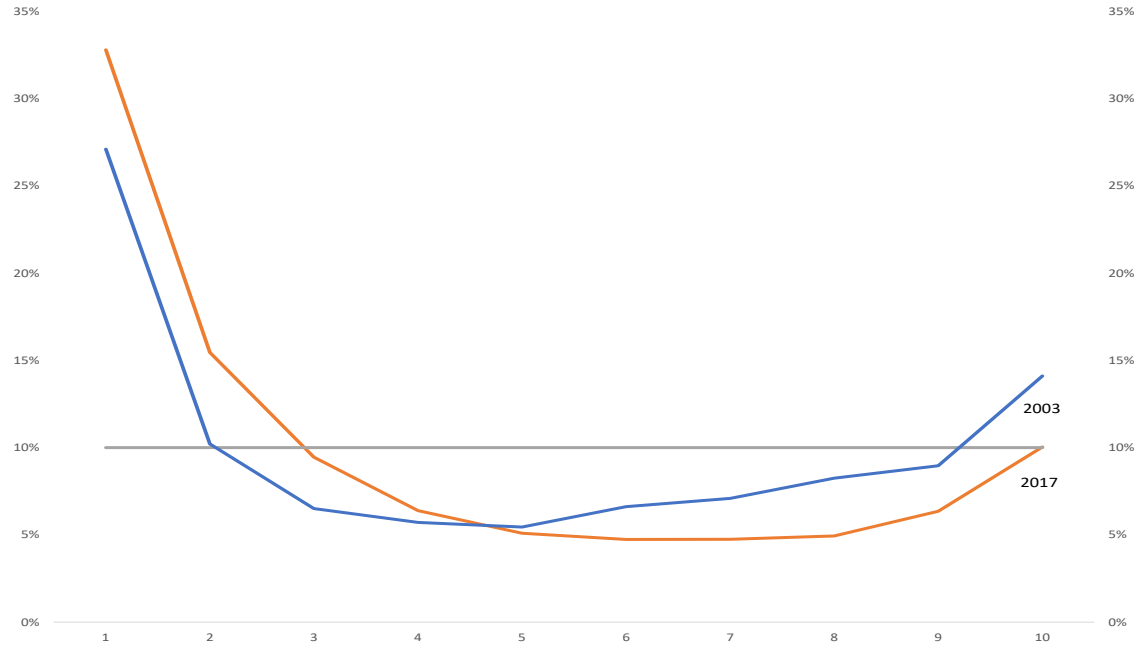
Note: The graph shows the evolution of MFP of entrants relative to the industry average (by year), over the period 2003-2017 for pooled OLS MFP estimates as well as Wooldridge MFP estimates (for both OLS and Wooldridge, the average for estimates using respectively value added and gross output is considered).

The relative productivity of firms in the years after entry (not shown) also reveals a downward trend over the period 2003-2017, suggesting that entrants and start-ups find it increasingly difficult to catch up with the industry average. After a continuous decline between 2003 and 2009, relative productivity increased substantially in 2010 and 2011, suggesting that the Great Recession following the 2007-2008 global financial crisis temporarily raised the entry barrier. From 2013, the decline in relative productivity of entrants resumed.

Graph 18 shows the share of entrants by decile of MFP (pooled OLS using value added), computed at the two-digit NACE level for 2003 and 2017. If the productivity distribution of entrants would completely match the distribution of incumbents, there would be about 10% of entrants in each decile. This is clearly not the case. The productivity of entrants is more polarized than that of incumbents. More than a quarter of entrants start at the lowest decile. The share of entrants also exceeded 10% at the highest decile in 2003, indicating that a relatively disproportional share of entrants succeeded in achieving high productivity from the start. The graph clearly reveals the deterioration of the relative productivity of entrants over the period 2003-2017. The share of entrants in the lower half of the productivity distribution was substantially higher in 2017 than in 2003 and the share of entrants in the upper half consequently lower. The share of entrants at the lowest decile increased from 27% in 2003 to 33% in 2017 whereas the share of entrants at the highest decile dropped from 14% in 2003 to 10% in 2017.

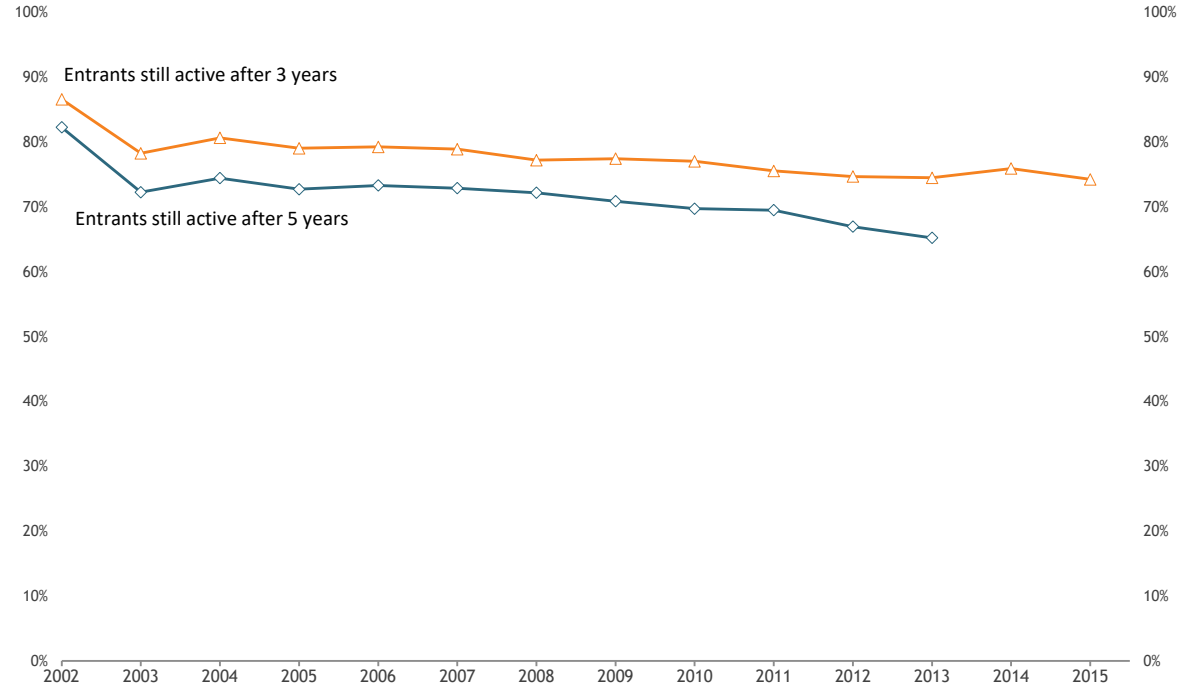
The deterioration of the position of start-ups is also reflected by the survival of entrants after three and five years, which is shown in graph 19. Both series show a clear decline in the share of entrants that survive for three or five years. As shown in graph 7 and confirmed by the results of the OECD Dynemp project discussed in section 2.2, entrants have a relatively high survival rate in Belgium compared to other countries.

Graph 18 Share of entrants by decile of industry-level Multi Factor productivity (2003 and 2017)



Note: The graph shows the percentage of entrants in each decile of Multi Factor Productivity (pooled OLS using value added), computed at the two-digit NACE industry level for 2003 and 2017.

Graph 19 Evolution of the three- and five-year survival rate of entrants (2003-2015)

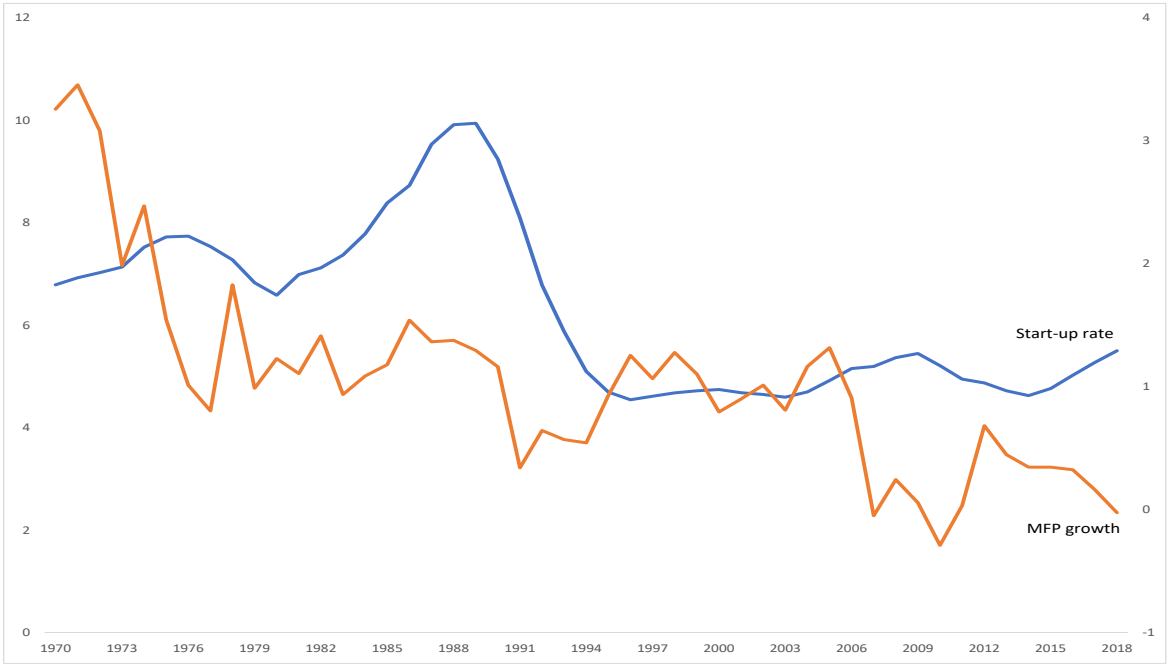


Note: The graph shows the percentage of entrants that started in the given year and were still active, respectively three and five years after entry.

The topic of this paper is the potential impact of (declining) business dynamism on productivity growth in Belgium. Graph 20 shows the evolution of business creation, using the data source for which the longest time series is available (cf. graph 2, non-financial corporations excluding partnerships and

associations) and MFP growth in Belgium over the period 1970-2019 from the Annual macro-economic (AMECO) database of the European Commission.

Graph 20 Evolution of the startup rate and MFP growth (1970-2019)
In %



Note: The graph shows the evolution of the five-year moving average of the startup rate (non-financial corporations, see graph 2) and MFP growth based on the Annual macro-economic (AMECO) database of the European Commission). The startup rate (in % of active corporations) is scaled on the left-hand vertical axis and MFP growth (in %) on the right-hand vertical axis

Both time series are smoothed by considering the five-year moving average to avoid the unclear pattern that emerges from annual observations and business cycles.

For MFP growth, the long-term decrease over the period 1971-2019 is very clear, despite strong fluctuations. The rate of business creation increased substantially in the 1980s but then declined considerably and appears to plateau at a rather low level since the mid-1990s. The correlation between the annual start-up rate and annual MFP growth over the entire period is statistically significant and positive (0.23). If the start-up rate is considered with a lag, to allow for the delayed impact of entry on productivity growth, correlation is lower for lags of one up to four years but increases again from a lag of five years onwards, indicating the potentially long lag between entry and productivity growth.

Correlation does not necessarily imply causation. As mentioned in the introduction, St-Amant and Tessier (2018) find evidence for Canada and the United States that productivity appears to cause entry rather than the other way round. Table A2.1 in Annex 3 shows the results of panel Granger causality tests of the link between the entry rate, exit rate and productivity based on the Belgian firm-level data that are used for the decomposition analysis, discussed in the next section.

The causality tests are performed on a panel of 67 two-digit industries (see list in Annex 1) over the period 2003-2017, using the test proposed by Dumitrescu and Hurlin (2012) which allows for heterogeneity across industries. Given the number of available years, the maximum number of lags that can be considered for the causality test is three. A three-year lag may fail to capture the full dynamic impact of

entry, given the evidence by Foster et al. (2019), mentioned in section 2.4, that entry first results in increased productivity dispersion and only after a substantial lag in an increase in productivity growth. Dejardin (2011) used data for districts in Belgium over the period 1982-1996, to test the impact of net entry on economic growth in manufacturing and services industries with entry and exit based on VAT data (including taxable self-employed entrepreneurs). In line with Fritsch (2008) he finds a wave pattern in the impact of net new business formation on growth in value added of Belgian districts, with years of a positive impact followed by years of a negative impact. The relationship appears to be industry-specific. For manufacturing industries in Belgium, results even suggest a negative link between net entry and value added growth, probably indicating an autoregressive relationship, whereas for services there are some indications of a positive impact, albeit with a lag, in line with the finding of Fritsch (2008), and more recently Foster et al. (2019), that a positive impact occurs with substantial delay.

Although the issue of causality is crucial in establishing the potential role of business dynamism in the slowdown of productivity growth, the observed wave pattern and considerable lag in the potential positive impact of entry and exit call for caution in the interpretation of causality tests, especially given that the period that is covered in this paper (2003-2017) only allows to consider a lag of maximum three years.

For productivity four alternative estimates of MFP are considered (Pooled OLS using value added and gross output respectively and Wooldridge using value added and gross output respectively) and tests consider the productivity level as well as productivity growth. The test considers the average as well as the median level of MFP. The results provide very mixed evidence. The choice of MFP estimate, using Pooled OLS or Wooldridge but also whether using value added or gross output for output, clearly matters for the conclusions. There are some indications that entry 'Granger causes' multi factor productivity, especially when using the gross-output MFP estimates but the causality also appears to, run the other way, from MFP to entry, in line with the results St-Amant and Tessier (2018). St-Amant and Tessier (2018) point at the limitations of causality tests. The fact that alternative estimates of productivity provide inconclusive results, calls for caution in drawing conclusions as to the causal link between business dynamism and productivity, especially when considering the potentially long lag between entry and productivity growth that cannot be accounted for with the relatively short period under consideration (2003-2017).

In the next section, the results of a decomposition of MFP growth for the four alternative MFP estimates are discussed. A decomposition does not provide any evidence on causal effects but rather aims at showing the relative contribution of several aspects of business dynamism, such as entry and exit, reallocation between incumbents and firm-level productivity growth to industry-level productivity growth and the evolution over time of these contributions.

3.2. Decomposition results

Several alternative procedures can be applied for the decomposition of productivity growth within industries (see Balk 2016 for a review). Melitz and Polanec (2014) proposed a dynamic expansion of the decomposition by Olley and Pakes (1996). The authors argued that their approach, contrary to the decomposition of Griliches and Regev (1995) and Foster, Haltiwanger and Krizan (2001), does not overestimate the contribution of entrants as they use different reference productivity levels for different groups of firms. However, Riley, Rosazza Bondibene and Young (2014) point out that by using unweighted productivity changes, the decomposition of Melitz and Polanec (2014) is sensitive to the performance of small companies which may result in substantial measurement error. This is tackled by Hyytinen and Maliranta (2013), who proposed a decomposition in line with Melitz and Polanec (2014) but less sensitive to productivity changes of small companies, as they avoid unweighted productivity changes. They also provide a breakdown by age groups. The decomposition by Hyytinen and Maliranta (2013), with a breakdown by age groups, has been applied by Dumont et al. (2016) to six EU countries (including Belgium), using meta-frontier efficiency as estimated by Verschelde et al. (2016). This decomposition approach, with a breakdown of incumbents into three age groups, is also used in this paper, using MFP estimates from pooled OLS and Wooldridge and using as output, respectively value added and gross output. Annex 4 provides a brief methodological note on the decomposition. Apart from entrants (age=0), three age groups are considered (firms aged from 1 up to 4 years; firms aged from 5 up to 9 years old and firms aged 10 years or more).

A decomposition of productivity growth shows the contribution of several factors that contribute to industry-level productivity growth. The entry component indicates the contribution of firms in their first year of activity. If firms enter with a productivity level above (below) the industry average, they will have a positive (negative) contribution to the productivity growth in their industry. The exit component shows the contribution of firms that exit from an industry. If a firm that exits an industry had a productivity above (below) the industry average in the year before exit, the exit will have a negative (positive) impact on industry-level productivity growth. The between component shows the contribution of reallocation between incumbents. If a firm with a productivity level above (below) the industry average witnesses an increase (decrease) in its share in industry output (value added or gross output), it will have a positive impact on industry-level productivity growth and a negative impact the other way round. Finally, the within component shows the contribution of firm-level productivity growth, with a straightforward link to industry-level productivity growth in terms of the sign of growth. The decomposition considers MFP weighted by the share of firms in industry output. The contribution to industry-level MFP growth, of a firm that enters, exits, or witnesses productivity growth, will be more substantial the larger the firm is.

Table 2 shows the results of the decomposition for the four alternative estimates of MFP.[36] The components are averages over 67 two-digit industries for the period 2003-2017 (see Annex 1 for a list of the industries and Annex 5 for average relative components by two-digit industry). The relative

[36] To avoid the influence of outliers on the results, the top and bottom 1% across all industries and years of MFP, MFP growth and the relative components resulting from the decomposition of MFP growth are not considered. Industries with too few observations (firms) are also not considered.

contribution of each component is computed as the computed component, relative to the absolute value of the growth in industry-level share-weighted MFP[37].

Table 2 Components of industry-level MFP growth (2003-2017)
Component relative to the absolute value of industry-level MFP growth

	Pooled OLS (Value added)	Pooled OLS (Gross output)	Wooldridge (Value added)	Wooldridge (Gross output)
MFP growth (weighted)	0.02	0.00	0.00	0.00
Entry	0.09	-0.05	-0.13	-0.50
Exit	-0.14	-0.08	-0.21	-0.56
Age 1-4 years	-0.03	-0.01	-0.02	-0.04
Age 5-9 years	-0.04	-0.02	-0.03	-0.05
Age 10 or more	-0.07	-0.05	-0.16	-0.48
Between (reallocation)	-0.25	0.08	-0.35	-0.26
Age 1-4 years	-0.31	-0.21	-0.69	-0.68
Age 5-9 years	-0.02	0.05	0.07	0.10
Age 10 or more	0.09	0.24	0.27	0.32
Within (firm-level productivity growth)	0.86	0.10	0.73	1.47
Age 1-4 years	0.55	0.40	0.81	0.91
Age 5-9 years	-0.02	-0.03	-0.17	0.22
Age 10 or more	0.33	-0.28	0.09	0.34

Note: The table shows the components of MFP growth for alternative MFP estimates, averaged over 67 two-digit industries (see Annex 1) and years, relative to the absolute value of MFP growth so that the sign of the relative component is determined by the sign of that component and not by the sign of MFP growth which may be negative. As the table reports averages over two-digit industries and all years, the relative components do not sum to 1 (or -1 if MFP growth is negative) as they do at the level of each industry-year observation.

As MFP growth can be negative, using the absolute value of MFP growth ensures that the sign of each relative component reflects the sign of the contribution of each component to industry growth.

As the relative components have different signs, the absolute value of relative components can exceed 1. Although this is not the case for the averages over industries and years, it is the case for some specific industry-years or even average for industries as can be seen in the results by two-digit industry, averaged over the four alternative MFP estimates, shown in Annex 5.

The first row of table 2 shows that growth of weighted MFP, averaged over all industries and years, is zero for three MFP estimates and 2% when using the value-added pooled OLS MFP estimates. Average growth obviously conceals substantial heterogeneity across industries as shown in Annex 5.

Alternative estimates of MFP result in diverging conclusions, even as to the sign of relative components which may be explained by biases (transmission bias and price heterogeneity) that are not fully accounted for, as pointed out by Fuss and Theodorakopoulos (2018). Both Wooldridge and the gross-output pooled OLS MFP estimates suggest a negative entry component, as expected by the below-average productivity of entrants and in line with most other decompositions. Dumont et al. (2016), using meta-frontier technical efficiency rather than MFP, find a negative entry component for the period 2003-2009 for all considered EU countries (Belgium, Finland, France, Germany, Italy, and Spain).

[37] For MFP estimated using value added, value added is used to weigh the share of each firm in total industry value added and for MFP estimated using gross output, gross output is considered to weigh.

The positive entry component found when using pooled OLS MFP estimates based on value added seems to conflict with the average productivity of entrants below the industry average of entrants, shown in graph 16 but the decomposition uses productivity weighted by the share of firms in industry-level value added. When weighted by value added shares, productivity of entrants, based on pooled OLS estimates, is indeed on average higher than the industry average, indicating that entrants that start with high productivity are larger than less productive entrants.

A decomposition by Dumont (2011) of MFP growth, based on OLS estimates, for 12 manufacturing industries in Belgium over the years 2000-2008, also results in a positive entry component. This suggests that the result may be specific to OLS estimation and may be due to the disregard of the transmission bias.[38]

The sign of the relative exit component is negative for all four MFP estimates. This seems to conflict with the below-average productivity of exiting firms, shown in graph 16, but again can be explained by the fact that the component is weighted by the industry share of firms and suggests that some large firms with a productivity above the industry average have exited. There are three times more exiting firms with below-average productivity in the year before exit than exiting firms with above-average productivity but as the latter have a substantially larger share in industry output, their exit has a disproportionately negative impact. The negative sign for exit is in line with the results for Belgium based on OLS estimates reported in Dumont (2011) but conflicts with the results based on meta-frontier estimates for six EU countries reported in Dumont et al. (2016), which found a positive contribution of exit to productivity growth for most countries and age groups. The negative contribution of exit appears to be common to all age groups but somewhat stronger for mature firms, which tend to be larger than start-ups and young firms.

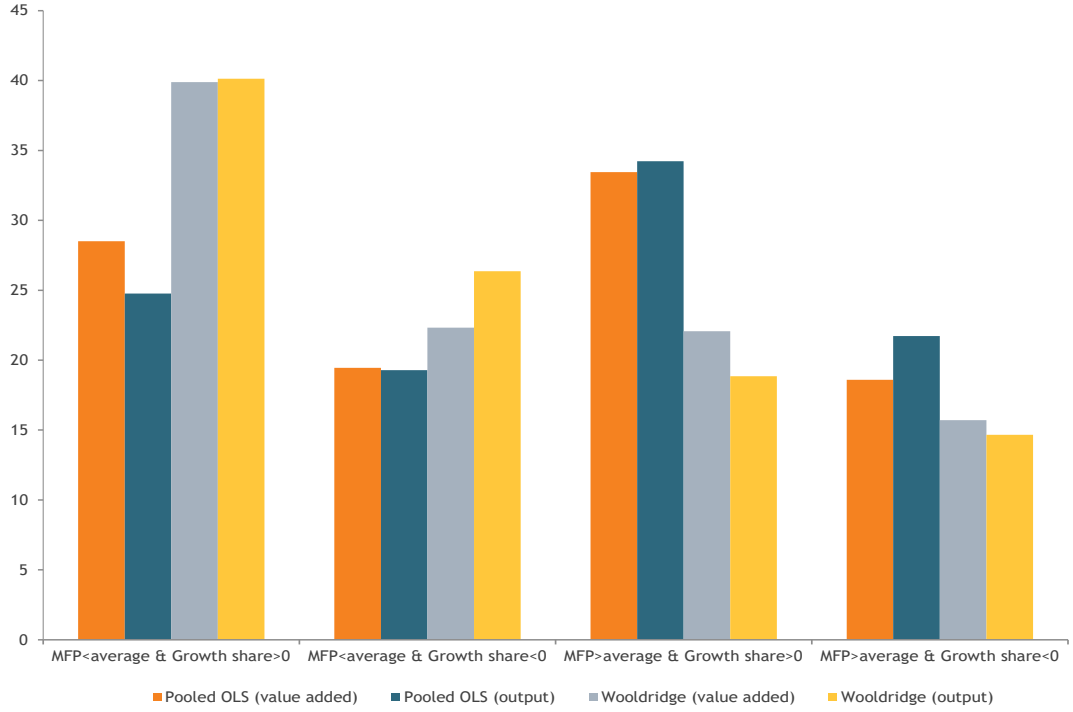
The results of the between component are rather similar, except for the positive sign of the aggregate component when using gross-output pooled OLS estimates. All four alternative MFP estimates agree on a shift from a negative contribution of reallocation for start-ups (1-4 years) to a positive contribution for mature incumbents (10 years old or more), in line with the result for Belgium reported in Dumont et al. (2016). Reallocation is clearly more productivity-enhancing for older firms than for start-ups, probably due to a phase of strategic experimentation that young firms go through. The difference in the sign and magnitude of the reallocation component across age groups shows that aggregate components without a breakdown by age can conceal diverging contributions of distinct age categories.

All four alternative MFP estimates agree that firm-level productivity growth has a positive and by far largest contribution (in absolute terms) to industry-level productivity growth. All estimates also agree that start-ups (1-4 years) contribute most to the within component. For older firms, the alternative MFP estimates are less unanimous. According to three out of four MFP estimates firm-level productivity growth of young firms (5-9 years) contributes negatively to industry-level productivity growth whereas the relative contribution of firm-level productivity growth of mature firms (10 years or more) is positive.

[38] The decomposition by Dumont (2011) did not follow Hyytinen and Maliranta (2013) but Foster, Haltiwanger and Krizan (2001).

Graph 21 provides more insight into the negative reallocation for start-ups. The graph shows the share of start-ups, depending on whether their MFP level is initially below or above the industry average and on whether they witness an increase or a decrease in their share in total industry output (respectively value added and output). The negative reallocation component is explained by the large share of start-ups with an MFP level below the industry average (see graph 16) that witness an increase in their share in total industry output and far less by start-ups with above-average MFP that witness a decrease in their output share. A majority of surviving start-ups (between 59 and 62%) witness an increase in their share in total industry output, which seems to indicate that building a customer base is essential for start-ups in the early years after entry. The positive within component for start-ups indicates that below-average MFP of start-ups is also linked with higher productivity growth (reflecting catch-up as can be seen in graph 16).

Graph 21 Share of startups by relative MFP and growth in industry output share (2003-2017)
In % of startups

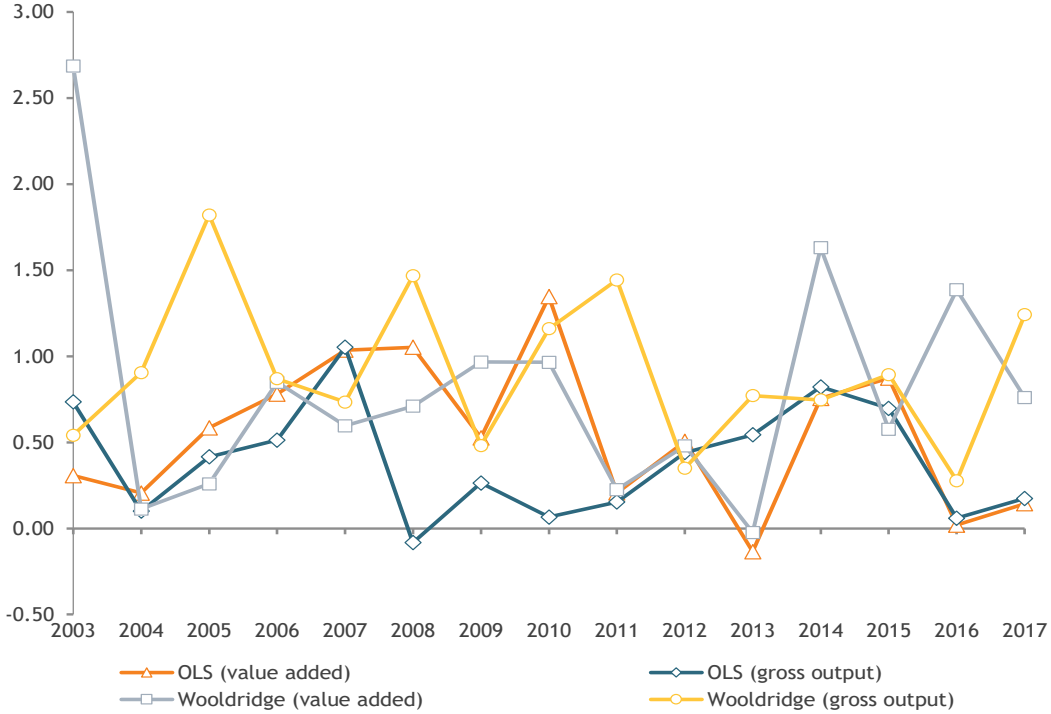


Note: The graph shows the share (%) of startups (1-4 years) depending on whether they have a MFP level below or above the industry average (mean) and whether they witness an increase in their share in the industry output (value added or output depending on the output indicator considered for MFP estimation).

Annual results on the relative contribution of reallocation of start-ups reveals no clear trend but rather a relatively stable negative contribution over the period 2003-2017.

Graph 22 shows the evolution of firm-level productivity growth (within component) for start-ups (1-4 years) for the four alternative MFP estimates. With few exceptions, the contribution of productivity growth of start-ups is positive over the entire period but declines over time.

Graph 22 Evolution of the relative within component for startups (2003-2017)
Component relative to absolute value of weighted MFP growth



Note: The graph shows the components of MFP growth, average over two-digit industries, relative to the absolute value of MFP growth so that the sign of the relative component is determined by the sign of that component and not by the sign of MFP growth which may be negative.

For older firms there are also some indications of a decline in the relative contribution of firm-level productivity growth but the decline appears to be less steep and conclusions are less robust across alternative MFP estimates.

As mentioned before, Dejardin (2011) provides evidence that the impact of net entry on growth in value added in Belgian districts differs considerably between manufacturing and services industries. To assess the potential difference in the results of the decomposition of MFP growth, table 3 shows the results for manufacturing industries and table 4 the results for market services.

In line with the results for all industries reported in table 2, conclusions depend on which MFP estimate is considered. Results are more affected by some large contributions in some specific industries.

In market services, productivity growth of start-ups (within component) has the largest contribution (in absolute terms) to industry-level productivity growth of all components, for all four MFP estimates whereas for manufacturing industries, this is only found for one MFP estimate (Pooled OLS – gross output). For three out of four MFP estimates, the negative relative contribution of reallocation of start-ups is larger in market services than in manufacturing industries. The general pattern of start-ups that gain market shares, even when they start with a productivity level below the industry average and at the same time witness substantial productivity growth seems more pronounced in market services than in manufacturing industries.

Table 3 **Components of industry-level MFP growth (2003-2017) in manufacturing industries**
Component relative to the absolute value of industry-level MFP growth

	Pooled OLS (Value added)	Pooled OLS (Gross output)	Wooldridge (Value added)	Wooldridge (Gross output)
MFP growth (weighted)	0.02	0.00	0.01	0.00
Entry	0.12	-0.02	-0.17	-0.32
Exit	0.03	-0.07	0.03	-1.63
Age 1-4 years	0.01	0.01	0.01	-0.24
Age 5-9 years	0.01	-0.03	0.01	-0.11
Age 10 or more	0.01	-0.05	0.01	-1.28
Between (reallocation)	-0.23	-0.06	0.56	-0.49
Age 1-4 years	-0.05	-0.16	-0.31	-0.67
Age 5-9 years	0.00	0.01	-0.01	-0.01
Age 10 or more	-0.17	0.09	0.88	0.20
Within (firm-level productivity growth)	1.08	0.35	-0.43	2.54
Age 1-4 years	0.27	0.26	0.17	1.18
Age 5-9 years	0.00	0.03	-0.06	0.41
Age 10 or more	0.80	0.06	-0.54	0.95

Note: The table shows the components of MFP growth for alternative MFP estimates, averaged over two-digit manufacturing industries and years, relative to the absolute value of MFP growth so that the sign of the relative component is determined by the sign of that component and not by the sign of MFP growth which may be negative. As the table reports averages over two-digit industries and all years, the relative components do not sum to 1 (or -1 if MFP growth is negative) as they do at the level of each industry-year observation.

Table 4 **Components of industry-level MFP growth (2003-2017) in market services**
Component relative to the absolute value of industry-level MFP growth

	Pooled OLS (Value added)	Pooled OLS (Gross output)	Wooldridge (Value added)	Wooldridge (Gross output)
MFP growth (weighted)	0.00	-0.01	0.00	0.01
Entry	0.07	-0.06	-0.13	-0.52
Exit	-0.18	-0.06	-0.34	-0.10
Age 1-4 years	-0.03	-0.03	-0.02	0.02
Age 5-9 years	-0.05	-0.02	-0.08	-0.02
Age 10 or more	-0.10	-0.01	-0.24	-0.10
Between (reallocation)	-0.24	-0.02	-0.74	-0.23
Age 1-4 years	-0.34	-0.19	-0.84	-0.56
Age 5-9 years	-0.02	0.02	0.01	0.08
Age 10 or more	0.12	0.15	0.09	0.25
Within (firm-level productivity growth)	0.66	0.09	1.31	1.20
Age 1-4 years	0.59	0.38	1.18	0.71
Age 5-9 years	0.00	-0.03	-0.04	0.16
Age 10 or more	0.08	-0.26	0.17	0.32

Note: The table shows the components of MFP growth for alternative MFP estimates, averaged over two-digit markets services industries and years, relative to the absolute value of MFP growth so that the sign of the relative component is determined by the sign of that component and not by the sign of MFP growth which may be negative. As the table reports averages over two-digit industries and all years, the relative components do not sum to 1 (or -1 if MFP growth is negative) as they do at the level of each industry-year observation.

The results of the decomposition of industry-level productivity growth are sensitive to the choice of the productivity estimate that is considered. The breakdown of incumbents by age reveals some diverging patterns across age groups that are concealed by a decomposition that aggregates all incumbents. There

are robust indications that start-ups gain market shares in the early years after entry, before they have caught up with the industry average productivity level, hence a negative contribution of reallocation for start-ups. As incumbents become older, reallocation of industry shares becomes more productivity-enhancing as incumbents with above-average productivity tend to increase their share in industry output and incumbents with below-average productivity witness a decrease in their industry share. The largest relative component of industry-level productivity growth is the positive contribution of productivity growth of start-ups in the early years after entry, reconfirming the important role of start-ups. There are however indications that start-ups have increasing difficulties to catch up with the industry average just as entrants tend to start with lower relative productivity at the end of the observed period than at the beginning.

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Annexes

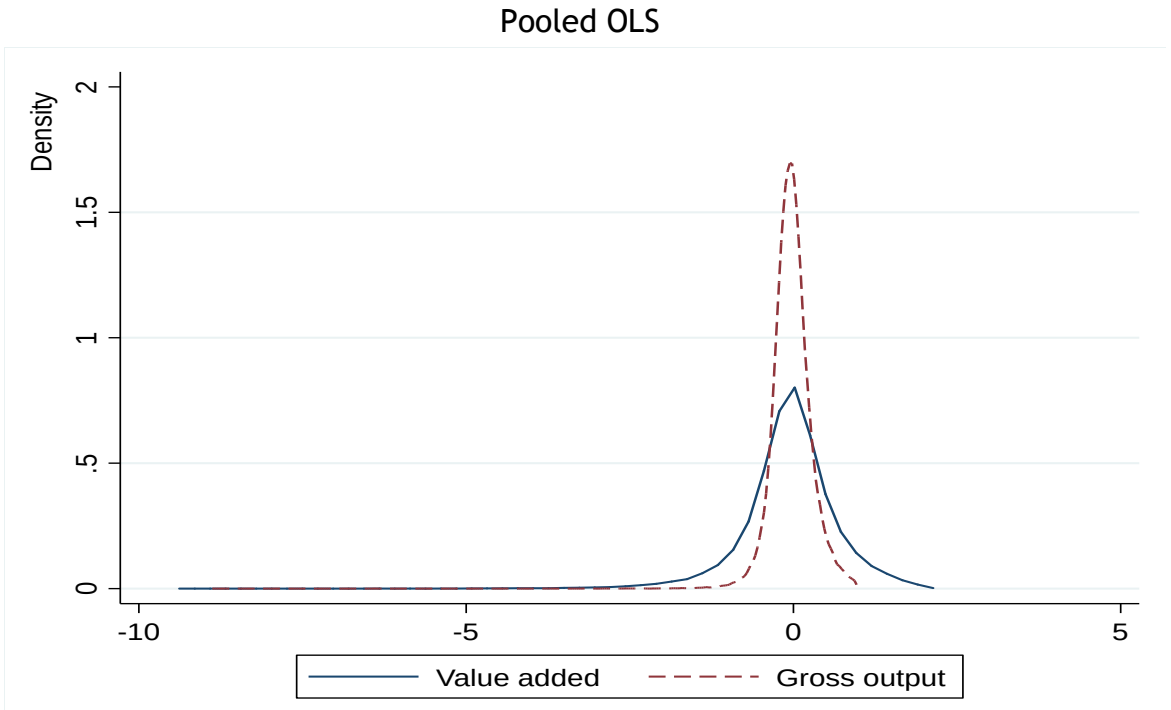
Annex 1: List of two-digit industries (NACE rev. 2)

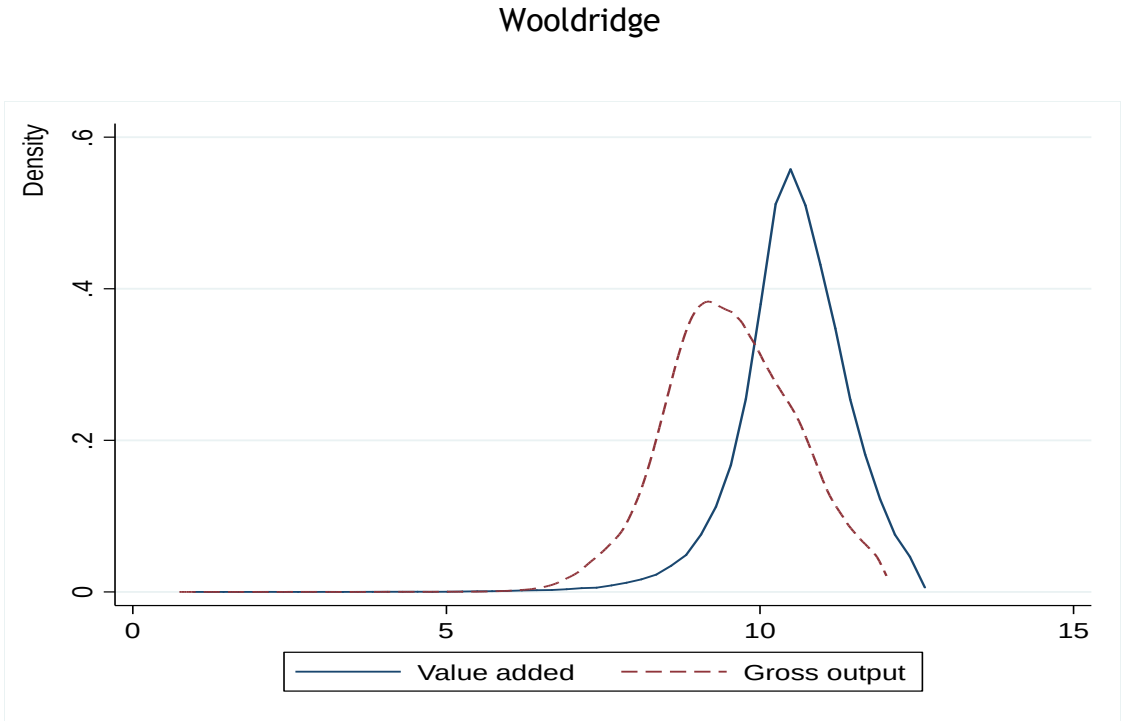
Table A1.5 List of two-digit NACE industries considered for analysis and decomposition

NACE	
	MANUFACTURING INDUSTRIES
10	Manufacture of food products
11	Manufacture of beverages
12	Manufacture of tobacco products
13	Manufacture of textiles
14	Manufacture of wearing apparel
15	Manufacture of leather and related products
16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
17	Manufacture of paper and paper products
18	Printing and reproduction of recorded media
20	Manufacture of chemicals and chemical products
21	Manufacture of basic pharmaceutical products and pharmaceutical preparations
22	Manufacture of rubber and plastic products
23	Manufacture of other non-metallic mineral products
24	Manufacture of basic metals
25	Manufacture of fabricated metal products, except machinery and equipment
26	Manufacture of computer, electronic and optical products
27	Manufacture of electrical equipment
28	Manufacture of machinery and equipment n.e.c.
29	Manufacture of motor vehicles, trailers and semi-trailers
30	Manufacture of other transport equipment
31	Manufacture of furniture
32	Other manufacturing
33	Repair and installation of machinery and equipment
35	Electricity, gas, steam and air conditioning supply
37	Sewerage
38	Waste collection, treatment and disposal activities; materials recovery
41	Construction of buildings
42	Civil engineering
43	Specialised construction activities
	MARKET SERVICES
45	Wholesale and retail trade and repair of motor vehicles and motorcycles
46	Wholesale trade, except of motor vehicles and motorcycles
47	Retail trade, except of motor vehicles and motorcycles
49	Land transport and transport via pipelines
50	Water transport
52	Warehousing and support activities for transportation
53	Postal and courier activities
55	Accommodation
56	Food and beverage service activities

58	Publishing activities
59	Motion picture, video and television programme production, sound recording and music publishing activities
61	Telecommunications
62	Computer programming, consultancy and related activities
63	Information service activities
68	Real estate activities
69	Legal and accounting activities
70	Activities of head offices; management consultancy activities
71	Architectural and engineering activities; technical testing and analysis
72	Scientific research and development
73	Advertising and market research
74	Other professional, scientific and technical activities
75	Veterinary activities
77	Rental and leasing activities
78	Employment activities
79	Travel agency, tour operator and other reservation service and related activities
80	Security and investigation activities
81	Services to buildings and landscape activities
82	Office administrative, office support and other business support activities
86	Human health activities
87	Residential care activities
88	Social work activities without accommodation
90	Creative, arts and entertainment activities
91	Libraries, archives, museums and other cultural activities
92	Gambling and betting activities
93	Sports activities and amusement and recreation activities
94	Activities of membership organisations
95	Repair of computers and personal and household goods
96	Other personal service activities

Annex 2: Distribution of alternative MFP estimates (2017)





Note: The top graph shows the distribution of log (MFP) estimates at the two-digit industry level in 2018 for two alternative estimations of MFP (pooled OLS and Wooldridge) using respectively value added and gross output as output indicator, MFP Wooldridge is estimated using the Stata procedure 'prodest' created by Rovigatti and Mollisi (2018).

Annex 3: Panel Granger Causality tests

Table A3.6 Results of panel Granger causality test of the link between entry, exit and productivity

Value added						
	Entry	Exit	Av. OLS	Median OLS	Av. WOOLD	Median WOOLD
Entry rate				Yes		
Exit rate	Yes				Yes	
Average MFP pooled OLS						
Median MFP pooled OLS	Yes					
Average MFP Wooldridge						
Median MFP Wooldridge						
Gross output						
	Entry	Exit	Av. OLS	Median OLS	Av. WOOLD	Median WOOLD
Entry rate				Yes	Yes	Yes
Exit rate						Yes
Average MFP pooled OLS	Yes					
Median MFP pooled OLS	Yes					
Average MFP Wooldridge						
Median MFP Wooldridge						

Note: The table shows whether the variable in the first column Granger causes the variables in the following columns, based on the Panel Granger causality test proposed by Dumitrescu and Hurlin (2012). The panel consists in two-digit industries over the period 2003-2017. Entry and exit rates are computed based on the firm-level data of active firms and productivity variables are the industry averages of the firms, except for median MFP. Results are based on the Stata procedure XTGCAUSE, created by Lopez and Weber (2017). A variable is reported to Granger cause another variable if the p-value of Z-bar tilde is below 0.05. According to Lopez and Weber (2017) for large N but relatively small T datasets, Z-bar tilde should be favoured. The lag order is determined empirically based on the Aikake Information Criterion (AIC). Given the number of available years, the maximum lag is three years. Panel unit root tests (XTUNITROOT) indicate that all variables are stationary, except the exit rate for which the null hypothesis of a unt root (non-stationarity- cannot be rejected using the Levin-Lin-Chu unit-root test. The null hypothesis of non-stationarity is also rejected for the exit rate using the Harris-Tzavalis unit-root test.

Annex 4: Methodological note on the decomposition of productivity growth

Hyytinen and Maliranta (2013) propose a decomposition of industry-level productivity growth by firm age (K age groups):

$$\Delta\Phi_t = \Phi_t - \Phi_{t-1} = EN_t + \sum_{k=1}^{K} EX_{k,t} + \sum_{k=1}^{K} BW_{k,t} + \sum_{k=1}^{K} WH_{k,t}$$

Industry-level productivity is the share-weighted sum of firm-level productivity: $\Phi_t = \sum_i w_{it}\,\varphi_{it}$ with w_{it} the share of firm *i* in industry output (value added or gross output depending on the MFP estimate) in year *t* and φ_i firm *i*'s productivity. Except for the entry component, all components are broken down by firm age. Firms are grouped into three categories: entrants (E); firms that exit in the next year (D) and firms that are active in this year as well as next year (C). Exiting firms and incumbents are further broken down into age groups Ω_k (k: 1...K):

- **Entry**: $EN_t = S_t^E[\Phi_t^E - \Phi_t^C]$, $S_t^E = \frac{\sum_{i\epsilon E} OUTPUT_{it}}{\sum_i OUTPUT_{it}}$
- **Exit (k-th age group)**: $EX_{k,t} = S_{k,t-1}^D[\Phi_{t-1}^C - \Phi_{t-1}^D]$, $S_{k,t-1}^D = \frac{\sum_{i\epsilon D\cap\,\Omega_k} OUTPUT_{it-1}}{\sum_{i\epsilon C\cup D} OUTPUT_{it-1}}$
- **Between-firm reallocation (k-th age group)**: $BW_{k,t} = \sum_{i\epsilon C\cap\,\Omega_k} \Delta w_{it}^C[\overline{\varphi}_{it} - \overline{\Phi}_t^C]$, $\overline{\ }$ denotes the average over *t* and *t-1*
- **Within- firm growth (k-th age group)**: $WH_{k,t} = \sum_{i\epsilon C\cap\,\Omega_k} \overline{w}_{it}^C \Delta\varphi_{it}$.

In the decomposition three age groups are considered, as defined in table A4.1.

Table A4.7 Definition of age groups of firms used for the decomposition of MFP growth

Entry	A firm is considered to enter in the first year for which employment is strictly positive, provided that the firm is not older than five (based on its year of incorporation)
Exit	A firm is considered to exit in the year for which employment is no longer reported or no longer strictly positive after previous year(s) with strictly positive employment insofar that the firm does not reappear (re-entry) in one of the following years of the period 2003-2017
Incumbents	
Start-up	Firms younger than five, excluding the year of entry
Young	Firms older than five and not older than 10
Mature	Firms 10 years or older

Annex 5: Relative components and MFP growth by two-digit NACE industry (2003-2017)

Table A5.8 Average of relative components and MFP growth over four alternative MFP estimates by two-digit NACE industry (2003-2017)

NACE	ENTRY	EXIT	BETWEEN	WITHIN	MFP growth (%)
10	-0.17	-1.16	0.05	1.39	0.01
11	-0.12	-0.19	-0.07	0.47	0.00
12	0.00	-0.07	-0.08	0.30	0.02
13	-0.04	-0.06	1.03	-0.90	0.00
14	-0.07	0.02	0.73	-0.72	0.00
15	-0.84	-0.42	-0.62	1.84	-0.01
16	-0.07	-0.09	0.22	-0.05	0.00
17	-0.13	-0.28	0.25	0.02	0.00
18	-0.07	-0.14	0.38	-0.17	0.00
20	-0.19	-0.47	-0.07	0.77	0.00
21	-0.17	-0.40	-0.31	1.02	0.01
22	0.10	-0.24	1.14	-0.82	0.01
23	-0.03	-0.23	-0.15	0.55	0.01
24	-0.21	-0.08	1.72	-1.69	-0.01
25	-0.02	-0.38	0.21	0.28	0.00
26	-0.03	-0.49	-0.49	1.12	0.01
27	-0.87	-0.27	2.16	-1.12	0.00
28	-0.06	-0.14	0.33	-0.06	0.00
29	0.78	-2.52	-1.08	3.33	0.01
30	-0.09	0.00	-0.02	0.06	0.01
31	-0.20	-0.37	0.94	-0.50	-0.01
32	-1.92	-0.21	-27.43	29.66	0.00
33	-0.13	-0.23	-0.67	1.16	0.01
35	-0.34	0.14	-0.66	0.99	0.02
37	0.00	-0.01	-0.17	0.30	0.01
38	-0.05	-0.21	0.42	-0.03	-0.01
41	-0.08	-0.74	-0.39	1.50	0.01
42	-0.36	-0.39	-1.19	1.98	0.00
43	0.07	-0.37	0.73	-0.15	0.00
45	0.14	-1.20	0.62	0.51	0.00
46	-0.39	-0.96	0.35	1.20	0.01
47	-0.14	-0.28	-0.35	0.83	0.00
49	-0.08	-0.32	-0.44	0.99	0.00
50	0.26	-0.08	-0.14	-0.14	-0.01
52	0.03	-0.19	-1.10	1.55	0.00
53	-0.21	-1.50	-0.01	1.82	0.00
55	-0.17	0.01	-0.34	0.50	0.00
56	-0.59	-0.09	-1.03	1.77	0.00
58	-0.04	-0.16	-0.03	0.34	0.00
59	-0.18	-0.02	-0.15	0.56	0.00
61	-0.75	-0.48	-2.60	4.13	0.02
62	-0.22	-0.59	-0.47	1.56	0.01

NACE	ENTRY	EXIT	BETWEEN	WITHIN	MFP growth (%)
63	-0.04	-0.02	0.14	0.13	0.02
68	-0.24	-0.16	-0.23	0.80	0.01
69	-0.16	-0.49	-0.29	1.14	0.01
70	-0.07	-0.40	-0.94	1.71	0.00
71	-0.13	-0.08	0.87	-0.56	0.01
72	-0.90	-0.04	-8.93	9.90	0.00
73	-0.31	-0.76	-0.05	1.26	0.01
74	-0.09	-0.01	0.10	0.16	0.01
75	-2.20	-0.03	-0.49	2.62	0.00
77	-0.06	-0.14	-0.28	0.62	0.00
78	-1.64	-1.85	-1.33	4.95	0.01
79	-0.37	-0.82	-0.66	2.12	0.02
80	-0.07	0.00	-0.37	0.51	0.01
81	-9.23	-0.59	-17.02	26.87	0.01
82	-0.71	-2.53	4.12	-0.61	0.01
86	-0.32	0.35	-0.09	0.35	0.02
87	-0.44	0.63	-0.25	0.46	0.01
88	-0.39	0.08	-0.21	0.62	0.01
90	-0.09	-0.05	-0.02	0.22	0.00
91	0.03	0.00	0.51	-0.21	0.04
92	0.00	-0.01	0.40	-0.19	0.02
93	0.49	-0.02	-4.17	4.09	0.02
94	-0.06	-0.04	-0.05	0.02	-0.01
95	-0.39	0.00	0.03	0.40	0.00
96	-0.69	-0.17	-1.84	2.80	0.00

Note: The table shows the average over the four alternative MFP estimates and over years. MFP growth is not in relative terms but shows the average of growth in weighted MFP (in %). See Annex 1 for a full description of two-digit NACE.