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**STUDY ON FIRM-LEVEL DRIVERS OF EXPORT PERFORMANCE
AND EXTERNAL COMPETITIVENESS IN ITALY**

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Abstract

This report provides an in-depth study on the main firm-level drivers of corporate external competitiveness in Italy during the years of the recent crisis. In this sense, it contributes to the debate on the appraisal of the Italian international position by presenting granular evidences based on a large set of elaborations taking advantage both of the ISTAT ‘*Rapporto sulla competitività*’ micro-dataset and of the MET sample survey database (an original firm-level database with more than 120,000 observations).

Overall, our results confirm the high degree of heterogeneity of the Italian system and the well-known differences between internationalised and domestic companies in terms of structural, behavioural and performance dimensions. In particular, data highlight not only the strict correlation between internationalisation and innovative activities but also a change of attitude of Italian firms towards these strategies that started during the recession. When the analysis digs deeper into these correlations, econometric estimates controlling for firm-specific heterogeneities confirm the role of R&D and innovation in helping the company to penetrate foreign markets, while productivity turns out to be a key factor only for remaining and improving the performance on the international environment. On balance, then, the analyses show that, whilst structural factors play a key role for external competitiveness, there are also other fundamental firm-level aspects triggering superior performances. In particular, a non-negligible part of heterogeneity stems from strategical profiles, technological capabilities and ‘proactive’ behaviours. To this extent, our policy suggestions focus on the need to sustain and foster innovative activities to improve aggregate competitiveness.

Résumé

Ce rapport fournit une étude approfondie sur les principaux moteurs de la compétitivité externe des entreprises en Italie au cours des années de la crise récente. Dans ce sens, il contribue au débat sur l'évaluation de la position internationale italienne en présentant des preuves granulaires basées sur un large ensemble d'élaborations s'appuyant à la fois sur les micro-données du «Rapporto sulla competitività» par ISTAT et sur la base de données de l'enquête MET (une base originale de données d'entreprise qui se fonde sur plus de 120.000 observations).

Dans l'ensemble, nos résultats confirment le degré élevé d'hétérogénéité du système italien et les différences bien connues entre les entreprises internationalisés et nationales au niveau structurel, comportemental et de performance. En particulier, les données mettent en évidence non seulement l'étroite corrélation entre l'internationalisation et les activités innovantes, mais aussi un changement d'attitude des entreprises italiennes à l'égard de ces stratégies ; changement qui a commencé au cours de la récession. Lorsque l'analyse creuse ces corrélations plus profondément, les estimations économétriques tenant compte des hétérogénéités propres à l'entreprise confirment le rôle qui jouent la R&D et l'innovation pour aider l'entreprise à pénétrer les marchés étrangers, tandis que la productivité s'avère être un facteur-clé uniquement pour les entreprises qui souhaitent rester et améliorer leurs performances au niveau international. Dans l'ensemble, donc, les analyses montrent que, si les facteurs structurels jouent un rôle déterminant pour la compétitivité sur les marchés internationaux, il existe également d'autres aspects fondamentaux au sein de l'entreprise qui déclenchent des performances supérieures. En particulier, une partie non négligeable de l'hétérogénéité provient des profils stratégiques, des capacités technologiques et des comportements «proactifs». Dans ce contexte, nos suggestions de politiques se focalisent sur la nécessité de soutenir et de favoriser des activités novatrices pour améliorer la compétitivité globale.

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EXECUTIVE SUMMARY

This report provides an in-depth study on the **main firm-level drivers of corporate external competitiveness** in Italy during the Great Crisis. It aims at contributing to the debate on the appraisal of the Italian international position by presenting granular evidences based on a large set of elaborations and taking advantage of a wide set of information. Given the complexity of the subject, the analyses span from aggregate and firm-level descriptive statistics to thorough econometric estimates.

The rationale behind this work is to provide a contribution to the **debated interpretations about Italian external competitiveness and export performance**. On the one hand, some scholars see the decline of Italy's export market share (although after 2010 we registered a partial recovery) as a sign of the decreasing national competitiveness, and link this dynamic to a broad range of interconnected phenomena, such as:

- the low and stagnant productivity;
- the excessive diffusion of very small firms within the industrial population;
- the low propensity to innovate and undertake R&D projects, together with the Italian specialisation in the production of traditional low-tech goods;
- the subordinate positions of Italian companies within global value chains;
- the insufficient resorting to external management, often bound to the family dimension of many business companies;¹
- the institutional inefficiencies associated with public administration, market rigidities, and labour market reforms implemented in the last decades.

On the other hand, the alternative view calls the attention on the existence of highly competitive segments embedded within an extremely-heterogeneous industrial system. In particular, this second stance highlights:

- the stability of the positive trend of Italy's international performances over the recent years, especially when compared to those experienced by its main European competitors;
- the high degree of heterogeneity characterizing Italian firms' performances and strategies;
- the repositioning of many firms along market segments with higher value added made possible by an increasing effort to adapt to the fast-evolving competitive scenario;
- the radical transformations occurred in firms' internationalisation, innovation, and organization strategies triggered by the deep changes in the structure and the role of industrial districts;
- the performance on international markets notwithstanding the increasing pressure on international markets brought about by historical events such as the adoption of the Euro, the competition from the developing countries, and the ICT revolution.

Our study contributes to this debate by studying external competitiveness from a firm-level perspective and by accounting for the heterogeneous nature of the population of Italian companies.² The final goal

¹ In this regard, it is worth reminding that our comparison (between family firms run by a family member and by an external manager), which is carried out on a panel of ISTAT data covering the period 2011-2014, seems to go against this result in terms of value added, employment, and turnover growth rates.

² In this sense, it is worth stressing few caveats. First of all, the main focus of the work is represented by the external competitiveness of Italian firms, thus international comparisons are carried out at the aggregate level only. Secondly, given the fact that firm-level analyses are restricted to Italian companies, institutional and environmental factors, that might affect the external competitiveness, are typically regarded as given (being common to all the observations). Nevertheless, to cope with their correlation with the variables of interest, the econometric strategies are set up in order to identify the effects of the drivers that are purged from all the time-, sector-, and firm- specific (unobserved) factors, such as the business cycle, aggregate demand, institutional context, and technological regimes.

is to add significant value to the understanding of Italy's competitive position and to help designing effective policy recommendations.

To achieve this objective, **the study exploits a huge amount of information about the recent crisis coming from different data-sources.** In particular, it draws on **two very large firm-level databases that are representative of the Italian manufacturing and production services population.** The use of up-to-date data is paramount in studying the wide range of firms' behaviours and strategies adopted during the Great Recession. As a matter of fact, it is the only way to properly interpret and assess the structural developments caused by the economic downturn, as well as to identify and design a set of effective policy measures.

The first firm-level dataset is represented by the **'Rapporto sulla competitività dei settori' collected by the Italian National Institute of Statistics (ISTAT).** This database includes the entire population of Italian manufacturing firms during the second phase of the crisis (2011, 2014) and encompasses information on structural characteristics (employees, sector, geographical region, corporate group belonging, etc.) merged with other relevant economic variables (including value added, labour cost, export, import, etc.).

The second one is the **MET sample survey on Italian firms, which is made - up to now - of five waves (for a total of 120,396 observations) embracing the entire time span of the crisis (2008-2015).** This second database allowed to account for the multifaceted nature of competitiveness and to analyse firms' strategic profiles such as innovation, R&D, and networking relationships. Moreover, unlike many other firm-level databases, the MET survey is representative of the entire population of Industry (construction excluded) and Production Services (38 NACE Rev.2 3 digit sectors) and, thus, also includes firms with less than ten employees (i.e. the micro-sized firms). On top of that, the MET database is aligned with balance-sheet data, covering the entire population of Italian firms' balance sheet (CRIF-Cribis D&B).³ To this extent we have been able to match survey information with official financial and economic data.

The framework of our analyses acknowledges that **Italy has been suffering from a slow-growth trend that can be traced back since the 90s, long before the outbreak of the global recession.** This dynamic might reflect many factors, including its lower openness to the international environment (even in comparison with other European countries of similar size) and the resulting limited exposure to the beneficial effects of global integration. This gap does not seem to stem from a lower degree of import penetration and export propensity (notwithstanding a significant gap with Germany), but rather from a reduced involvement in the international production processes.

Since 2010, however, the long-lasting decline of Italian export shares ceased. Indeed, data on the value of Italian exports show a positive growth, roughly in line with the one for Germany, and even higher than the ones detected for other relevant peer economies such as France, UK, the Netherlands, and Belgium. This trend has been positively affected both by the geographical composition of the Italian export markets and by the favourable world demand for products of the Italian industrial specialisation. At the same time, starting from the arrival of the new millennium, this specialization has been going through a set of structural changes. In particular, the comparative advantages of the Italian industry in traditional low-tech productions progressively dwindled, while, those linked to medium-technology products have been strengthening (e.g. "Pharmaceuticals" and "Motor vehicles"). These dynamics have been coupled with an intra-sectoral restructuring following from a repositioning of a large number of Italian companies on market segments characterised by higher value-added levels.

An additional element represented as a weakness of the Italian economy is its low and stagnant labour productivity. During recent years, although negatively affecting the aggregate performance,

³ It is worth reminding that, according to the Italian law, the population of Italian firms' balance sheet encompasses limited companies and cooperatives. However, being representative of the entire population, MET survey also includes other types of firms whose balance sheet are not publicly available.

productivity dynamics have not translated into a significant loss of price competitiveness with respect to the other major Eurozone countries, because offset by a significant wage moderation. Moreover, a large degree of heterogeneity among firms emerges when these dynamics are broken down by size class. In particular, micro-sized (1-9 employees) and large (>250 employees) Italian enterprises turn out to be highly inefficient, lagging behind their European counterparts. Conversely, Italian small and medium firms (10-249 employees), and in particular those falling within the class 20-249, outperform the corresponding classes in Germany and Spain in terms both of productivity levels and of its recent growth trends. As such, our background analyses suggest that **one prominent weakness of the Italian economy has not to be traced back to the excessive number of micro-sized firms** (whose share is comparable to those detected both in France and in Spain), **but rather to their technical inefficiency compared to the micro-firms of other countries**. This outcome is also strictly related to poor performances in terms of innovative behaviours, human capital absorption, and degree of international openness. At the same time, the analyses of the main non-price competitiveness indices by size class suggest that, excluding micro-sized firms, Italian trends are not far from other main European economies.

The analysis of firm-level data confirmed the high degree of heterogeneity of the Italian system and the well-known differences between internationalised and domestic companies along a wide range of structural, behavioural, and performance dimensions. Indeed, internationalised companies are typically larger, more productive, and more innovative than domestic firms. Moreover, they also tend to underpin their innovations with R&D activities more often than those selling products on national markets only.

When looking at the importance of export activities within the Italian industry, **data highlight a significant growth trend in terms of both extensive and intensive margins of export since the outbreak of the crisis.** In particular, during the second wave, characterised by a drop of the Italian domestic aggregate demand, an increasing number of firms – especially the micro-sized ones - started to look abroad for new survival opportunities. Nevertheless, many of these companies turned out to be extremely weak and unable to sell persistently on foreign markets. In this way their behaviours negatively affected the overall aggregate national performance.

Obviously, **internationalisation is a heterogeneous phenomenon itself and its different forms entail diverse strategies associated with distinctive characteristics and behaviours.** In particular, the degree of complexity in the form of internationalisation is positively associated with the degree of persistence on foreign markets as more complex activities require a wider range of tasks to be accomplished. To this extent, the more complex is the form of internationalisation the higher is the propensity to undertake innovative activities, to hire high skilled human capital and dedicated management.

On balance, the analyses of sample survey data have shown that, whilst size and productivity play a key role for external competitiveness, there are also other fundamental aspects triggering superior performances. In particular, a non-negligible part of heterogeneity stems from firms' strategical profiles, technological capabilities and 'proactive' behaviours, especially innovative activities. In this regard, **we document a decreasing diffusion of the "traditional" Italian model characterised by incremental innovations without R&D activities.** Moreover, after an initial collapse in the share of innovative firms, the Italian industrial system has been witnessing a gradual rebound after 2010-2011 in the diffusion of proactive companies. In some of these cases, such as R&D activities, the share of firms involved in dynamic strategies in 2015 has even overtaken its pre-crisis value.

Within this framework, the econometric analysis emphasises the importance of both structural characteristics and strategic behaviours in determining firms' international performance. In terms of structural characteristics:

- we confirm the presence of a self-selection mechanism of more productive companies into international markets;

- although productivity is associated with a greater likelihood of exporting, once accounted for persistent characteristics that do not vary over time, its role is found to be largely reduced in explaining the change in the exporting status;
- on the other hand, productivity has a critical impact on the extent of firms' international performance (i.e., intensive margins) and on the decision to exit the foreign markets;
- other characteristics play a critical role in firms' export propensity, especially size and the affiliation to a corporate group;
- being an importer of intermediate products is largely associated with a higher probability of exporting, confirming how import policies may affect aggregate productivity, resource allocation, and industry export activity.

On top of that, a critical driver for external competitiveness is found to be linked to firms' strategic behaviours and investment in dynamic strategies. In particular:

- the introduction of innovations, the involvement in R&D projects, as well as undertaking new investments, induce a significant positive effect on export strategies and performance;
- the introduction of innovations is even more important in reaching extra-EU destinations and in affecting firms' switching strategies (i.e., the choice of entry or exit the international market);
- the integration of innovation and R&D activities implies *premia* on both the extensive and intensive margins of export;
- the path followed by the set of dynamic strategies undertaken in the past (adding or reducing the set of strategies, i.e., upgrading/downgrading paths) has additional effects on firms' international attitude;
- among the different types of innovations, new products dominate other forms of innovativeness (process or organisational-managerial), especially in case of previously non-exporting companies;
- process and organisational innovations have an additional indirect effect on export by boosting firms' productivity;
- innovative strategies have disproportionate effects for the international performance of (originally) less productive and small companies, pointing at innovativeness as a potential tool to fill the gap between large/productive companies and the set of less structured firms, a segment that represents an ideal target for policy measures.

We also **investigated the main determinants of firms' innovativeness** through a simultaneous equation model linking innovation with export activities. In this regard:

- structural characteristics significantly affect the introduction of innovations, especially for larger, younger, and more productive companies;
- the existence of R&D projects is clearly correlated to huge increases in the probability of introducing innovations;
- this effect is not limited to the investment in R&D performed within the firm (internal R&D), but extends to firms outsourcing R&D activities, even though with smaller magnitudes;
- the operating environment of a company, such as the affiliation to a corporate group and the establishment of close relationships with other domestic enterprises, is an additional critical factor in driving firm innovative activity;
- financial constraints are found to significantly affect a firm's capacity to innovate and the establishment of close ties with the main bank is documented to be extremely important in reducing informational asymmetries penalizing innovative SMEs.

Moreover, we find that **Global Value Chains (GVC) participation exerts a positive effect on firms' innovativeness and performance.** However, we emphasise relevant heterogeneities in how GVC participants fared the crisis, based on the type of relationship that takes place. While high-skill suppliers that are involved, without subordination, in GVC production processes display a significant

propensity to engage in innovative activities and R&D projects, other modes of GVC involvement have no premium compared to domestic companies. This heterogeneity is also reflected in differential productivity and sales growth. Compared to the pre-crisis trends, we document a severe demand shock for low-skill and subordinated firms, while relational GVCs appear to be somewhat sheltered from the effects of the crisis.

Overall, then, **the main contribution of our work to the debate on Italian external competitiveness points out the importance of behavioural and strategic factors in shaping firm-level competitive advantages.** Whilst there is no doubt about the importance of structural characteristics, such as size and productivity, our results also highlight the presence of different phenomena boosting firm internationalization. Among these, innovation and R&D play a crucial role and turn out to affect external competitiveness both directly and via productivity improvements. **Even though the positive effect of innovative activities and R&D is certainly not new, we explore several new levels of heterogeneity, as well as indirect effects, that may provide a sound base for the construction of granular policy implications.** In particular, the analyses allow for the identification of targeted segments of potentially innovative companies with the highest expected gains from the international activity. All these results, when read in light of the aggregate Italian poor performances, suggest that **the weaknesses of the industrial system are not prominently bound to its size-class and sector compositions.** As a matter of fact, comparative analyses stress that one of **the most influent deficiency of the Italian micro-sized firms lies in their innovative capacity, rather than in their large diffusion.** On top of that, in line with what emphasised by many scholars, our evidences seem to confirm the ongoing restructuring process undertaken by many companies, translating into a repositioning and a strategic upgrading along the production and market segments.

Pairing this information with constraints and weaknesses permits to derive some policy implications:

- the support to firms' R&D and innovation should keep being one of the main focus of policies for competitiveness. The choice of instruments has to explicitly consider needs and constraints of the targeted businesses;
- an essential issue of the work is represented by the research of differential effects due to the integration of three fundamental dynamic strategies (R&D, innovation and internationalisation), whereby the effect of integrating dynamic strategies by firms following a path of modernisation that is not yet completed appears to be very significant. The completion of this strategy and the integration of these activities is characterized - in our view - as one of the main goals to support firms' growth and to improve international competitiveness. Policy measures must be specifically targeted to these aims;
- along the same logical trail, the elimination or reduction of discontinuity in strategic business activities (with reference either to the intermittent presence on foreign markets or to the discontinuous innovative activities and R&D), in particular of smaller enterprises, seems to represent an "effective" policy target. The discontinuity can be directly influenced by appropriate and specific policy measures;
- financial constraints still constitute a substantial limitation to the growth of the most dynamic companies and to the improvement of their development strategies; this bond, by its very nature, is stronger for companies oriented towards innovation and R&D than for the static ones because of the significant market and technological risk and for the higher credit demand: access to credit (as well as to other financial instruments) could usefully have a specific orientation towards innovative projects, while the practice of current policy for credit access and equity support is more based on general targeting;
- the role of human capital as a constraint and as a driver of competitiveness weakly emerges in previous estimates and elaborations even if not detailed. However, it is clear that strongly focused policies on R&D and on innovative processes cannot ignore knowledge growth and facilitate firms' efforts in human resources improvement.

DOCUMENT DE SYNTHÈSE

Ce rapport fournit une étude approfondie sur les **principaux drivers de la compétitivité externe des entreprises** en Italie au cours des années de la crise récente. Le but est de contribuer au débat sur l'évaluation de la position internationale italienne en présentant des preuves granulaires basées sur un large ensemble d'élaborations s'appuyant sur un vaste gamme d'informations. Étant donné la complexité du sujet, les analyses réalisées vont des statistiques descriptives agrégées et à niveau d'entreprise à des estimations économétriques approfondies.

La raison d'être de ce travail est liée au fait que même si la **compétitivité extérieure italienne et ses performances en termes d'exportation sont deux sujets débattus, cependant il manque une évaluation largement acceptée**. D'une part, certains chercheurs interprètent la diminution des parts de marché des exportations de l'Italie (bien qu'après 2010 nous avons enregistré une reprise partielle) comme un signe de la baisse de la compétitivité nationale et relie cette dynamique à un large éventail de phénomènes interconnectés, tels que:

- la productivité faible et stagnante;
- la présence excessive de très petites entreprises au sein de la population industrielle;
- la faible propension à innover et à entreprendre des projets de R&D, avec la spécialisation dans la production de produits traditionnels et technologiquement faibles;
- la présence d'entreprises italiennes dans une position subalterne des chaînes de valeur mondiales;
- le recours insuffisant à manager externe, souvent lié à la dimension familiale de nombreuses sociétés;
- l'inefficacité des institutions associées à l'administration publique, la rigidité du marché, et les réformes du marché du travail mis en œuvre au cours des dernières décennies.

D'autre part, la vue alternative appelle l'attention sur la présence de segments très concurrentiel intégré dans un système industriel extrêmement hétérogène. En particulier, cette deuxième position souligne:

- la stabilité de la tendance positive des performances Italiennes au niveau internationale au cours des dernières années, en particulier par rapport à celles rencontrés par ses principaux concurrents européens;
- le haut degré d'hétérogénéité caractérisant les performances et les stratégies des firmes italiennes;
- le repositionnement de nombreuses entreprises le long de segments de marché à plus forte valeur ajoutée rendue possible par un effort croissant pour s'adapter au scénario compétitif en évolution rapide;
- les transformations radicales ont eu lieu dans les stratégies d'internationalisation, d'innovation et d'organisation des entreprises déclenchées par les changements profonds de la structure et le rôle des districts industriels;
- la performance sur les marchés internationaux en dépit de la pression croissante sur les marchés internationaux entraîné par des événements historiques tels que l'adoption de l'Euro, la concurrence des pays en développement, et la révolution des ICT.

Notre étude contribue à ce débat en abordant la question de la concurrence externe à partir d'une perspective à l'échelle de l'entreprise, permettant de rendre compte de l'hétérogénéité de la population des grandes entreprises italiennes.⁴ Son objectif final est de créer une valeur ajoutée importante à la

⁴ Dans ce contexte, ça vaut la peine de souligner quelques réserves. Tout d'abord, l'objectif principal de l'œuvre est représentée par la compétitivité externe des entreprises italiennes, les comparaisons internationales sont donc réalisées au niveau agrégé seulement. Deuxièmement, compte tenu du fait que les analyses sont limitées aux entreprises italiennes, les éléments institutionnels et environnementaux, qui pourraient affecter la compétitivité externe, sont typiquement

compréhension de la position concurrentielle de l'Italie et d'aider à développer des recommandations de politiques efficaces.

Pour atteindre cet objectif, **l'étude utilise une grand quantité d'informations provenant de différentes sources de données se référant à la crise récente.** En particulier, il s'appuie sur **deux très grandes bases de données au niveau des entreprises qui sont représentatives de la population italienne des services manufacturière et de production.** L'utilisation de données à jour est primordiale dans l'étude de la vaste gamme de comportements des entreprises et des stratégies adoptées au cours de la grande récession. En fait, c'est la seule façon de bien interpréter et évaluer les développements structurels causés par le ralentissement économique, ainsi que d'identifier et de concevoir un ensemble de mesures efficaces.

Le premier ensemble de données au niveau de l'entreprise est représenté par le **'Rapporto sulla competitività dei settori'** récoltées par l'**Institut national italien de statistique (ISTAT)**. Cette base de données inclut l'ensemble de la population des entreprises manufacturières italiennes au cours de la deuxième phase de la crise (2011, 2014) et englobe des informations sur les caractéristiques structurelles (employés, secteur, région géographique, groupe d'appartenance, etc.) combiné avec d'autres variables économiques (y compris la valeur ajoutée, les coûts de la main d'œuvre, l'exportation, l'importation, etc.).

Le deuxième est l'**enquête sur les entreprises italiennes effectué par MET, qui est constituée - jusqu'à présent - de 5 sondages (pour un total de 120396 observations), englobant ainsi la totalité de la période de la crise (2008-2015).** Cette deuxième base de données a permis de tenir compte de la nature complexe de la compétitivité et d'analyser les profils stratégiques des entreprises telles que l'innovation, R&D, et les relations de réseautage. De plus, contrairement aux autres bases de données au niveau des entreprises, l'enquête est représentative de l'ensemble de la population de l'industrie (construction exclue) et des services de production (38 NACE Rev.2 3 secteurs de chiffre) et, ainsi, comprend également les entreprises de moins de dix salariés (c.-à-d. les micro-entreprises). En outre, la base de données est aligné avec les données du bilan, couvrant l'ensemble de la population des bilans des entreprises italiennes (CRIF-Cribis D&B).⁵ Dans ce contexte, nous avons été en mesure de faire correspondre l'information de l'enquête avec les données financières et économiques officielles.

Le cadre de nos analyses reconnaît que **l'Italie a souffert d'une tendance à la croissance lente qui remonte aux années 90, bien avant le début de la récession mondiale.** Cette dynamique pourrait refléter plusieurs facteurs, notamment le bas degré d'ouverture à l'environnement international (même en comparaison avec d'autres pays européens de taille similaire) et l'exposition limitée aux effets bénéfiques de l'intégration mondiale qui en résulte. Cet écart ne semble pas découler d'un plus faible niveau de pénétration des importations et de propension à l'exportation (malgré un écart important avec l'Allemagne), mais plutôt d'une diminution de la participation dans le processus de production international.

Depuis 2010, toutefois, le déclin continu des parts des exportations italiennes a cessé. En effet, les données sur la valeur des exportations italiennes montrent une croissance positive, à peu près égale à celle de l'Allemagne, et même plus élevée que celles détectés dans d'autres économies importantes comme la France, le Royaume-Uni, les Pays-Bas et la Belgique. Cette tendance a été affecté de manière positive à la fois par la composition géographique des marchés d'exportation italiens et par l'évolution favorable de la demande mondiale pour les produits de la spécialisation industrielle

considérées comme étant donné (étant commun à toutes les observations). Néanmoins, pour faire face à leur corrélation avec les variables d'intérêt, les stratégies économétriques sont mises en place afin d'identifier les effets des facteurs qui sont purgés de tout élément d'heure-, secteur-, et spécifique à l'entreprise (non observée)-, tels que le cycle économique, la demande globale, le contexte institutionnel, et les régimes technologiques.

⁵ Il est important de rappeler que, selon la loi italienne, la population des bilans des entreprises italiennes englobe les sociétés à responsabilité limitée et les coopératives. Cependant, étant représentatif de l'ensemble de la population, l'étude MET comprend aussi d'autres types d'entreprises dont les bilans ne sont pas accessibles au public.

italienne. En même temps, à partir des années 2000, cette spécialisation a connu une série de changements structurels. En particulier, les avantages comparatifs de l'industrie italienne traditionnelle à basse technologie ont progressivement diminué, tandis que ceux liés aux produits de moyenne technologie ont été renforcés (p. ex. Les "produits pharmaceutiques" et "véhicules à moteur"). Ces dynamiques ont été associées à une restructuration intra-sectorielles à la suite d'un repositionnement d'un grand nombre d'entreprises italiennes sur les segments du marché caractérisés par des plus hauts niveaux de valeur ajoutée.

Un autre élément considéré comme une faiblesse de l'économie italienne est la faible et stagnante productivité de la main-d'œuvre. Au cours de ces dernières années, même si elles ont eu une incidence négative sur la performance globale, les dynamiques de la productivité ne se sont pas traduites par une perte importante de la compétitivité des prix à l'égard des autres pays importants de la zone euro, car compensée par une importante modération salariale. En outre, un haut degré d'hétérogénéité entre les entreprises émerge lorsque ces dynamiques sont ventilées par classe de taille. En particulier, les micro-entreprises (1-9 employés) et grandes entreprises (>250 employés) italiennes s'avèrent très inefficaces, à la traîne derrière leurs homologues européens. Au contraire, les petites et moyennes entreprises (10-249 employés), et en particulier celles dans la classe 20-249, dépassent les classes correspondantes en Allemagne et en Espagne à la fois en termes de niveaux de productivité et de ses tendances de croissance récentes. Ainsi, nos analyses contextuelles suggèrent qu'une **grande faiblesse de l'économie italienne ne doit pas être associée au trop grand nombre de micro-entreprises** (dont la part du marché est comparable à celles de la France et l'Espagne), **mais plutôt à leur inefficacité technique par rapport aux micro-entreprises d'autres pays.** Ce résultat est également strictement lié à des mauvaises performances en termes d'innovation, de l'absorption du capital humain, et de degré d'ouverture internationale. Parallèlement, les analyses des principaux indices de compétitivité hors-prix par classe de taille suggèrent que, à l'exclusion des micro-entreprises, les tendances italiennes ne sont pas loin de celles d'autres grandes économies européennes.

L'analyse des données au niveau de l'entreprise a confirmé la grande hétérogénéité du système italien et les bien-connues différences entre les entreprises nationales et internationalisées au niveau structurel, comportemental et de performance. En effet, les entreprises internationalisées sont généralement plus grandes, plus productives et plus innovatrices que les entreprises nationales. En outre, elles ont également tendance à soutenir leurs innovations avec les activités de R&D plus souvent que celles qui vendent des produits uniquement sur les marchés nationaux.

Lorsqu'on examine l'importance des activités d'exportation au sein de l'industrie italienne, **les données mettent en évidence une tendance significative à la croissance en termes de marges extensive et intensive de l'exportation depuis le début de la crise.** En particulier, au cours de la deuxième vague, caractérisée par une baisse de la demande agrégée domestique italienne, un nombre croissant d'entreprises - notamment les micro-entreprises - a commencé à chercher des nouvelles possibilités de survie à l'étranger. Néanmoins, beaucoup de ces entreprises se sont avérées être extrêmement faibles et incapables de vendre de façon persistante sur les marchés étrangers. De cette façon leurs comportements ont affecté négativement l'agrégat global des performances nationale.

De toute évidence, **l'internationalisation est un phénomène hétérogène lui-même et ses différentes formes engendrent différentes stratégies associées à caractéristiques et comportements spécifiques.** En particulier, le degré de complexité dans la forme d'internationalisation est positivement associée avec le degré de persistance sur les marchés étrangers, car des activités plus complexes nécessitent d'un plus large éventail de tâches à accomplir. Dans cette mesure, plus la forme d'internationalisation est complexe, plus il y a de la propension à entreprendre des activités innovantes, à embaucher du capital humain hautement qualifié et des cadres dévoués.

Dans l'ensemble, donc, les analyses montrent que, si les facteurs structurels jouent un rôle déterminant pour la compétitivité sur les marchés internationaux, il existe également d'autres aspects fondamentaux au sein de l'entreprise qui déclenchent des performances supérieures. En particulier, une partie non négligeable de l'hétérogénéité provient des profils stratégiques, des

capacités technologiques et des comportements «proactifs», notamment les activités novatrices. À cet égard, **nous observons la diminution de la diffusion du modèle "traditionnelle" italien caractérisé par des innovations incrémentales sans R&D.** De plus, après un effondrement initial de la part des entreprises innovantes, le système industriel italien a assisté à un rebond progressif de la diffusion des entreprises proactives après 2010-2011. Dans certains de ces cas, comme les activités de R & D, la part des entreprises impliquées dans les stratégies dynamiques en 2015 a même dépassé sa valeur avant la crise.

Dans ce cadre, l'analyse économétrique met l'accent sur l'importance des caractéristiques structurelles et les comportements stratégiques des entreprises dans la détermination de la performance internationale. En termes de caractéristiques structurelles:

- nous confirmons la présence d'un mécanisme d'auto-sélection des entreprises plus productives sur les marchés internationaux;
- bien que la productivité est associée à une probabilité d'exportation plus élevée, une fois pris en compte les caractéristiques persistantes qui ne varient pas au fil du temps, son rôle est minimale dans l'explication du changement du statut d'exportation;
- d'autre part, la productivité a un impact important sur l'ampleur des performances internationales des entreprises (c.-à-d., marges intensive) et sur la décision de quitter les marchés étrangers;
- d'autres caractéristiques jouent un rôle critique dans la propension des entreprises à l'exportation, en particulier la taille et l'affiliation à un groupe de sociétés;
- être un importateur de produits intermédiaires est largement associé à une probabilité plus élevée d'exportation, confirmation de la façon dont les politiques d'importation peuvent affecter la productivité globale, l'allocation des ressources, et l'activité d'exportation de l'industrie.

De plus, un des éléments critiques pour la compétitivité extérieure est associé à des comportements stratégiques des entreprises et à l'investissement dans des stratégies dynamiques. En particulier:

- l'introduction d'innovations, la participation à des projets de R&D, ainsi que la réalisation de nouveaux investissements, susciter un effet positif important sur les stratégies et les performances des exportations;
- l'introduction d'innovations est encore plus important pour atteindre les destinations extra-UE et affecter les stratégies de substitution des entreprises (c.-à-d., le choix d'entrée et sortir du marché international);
- l'intégration de l'innovation et des activités de R&D implique des primes à la fois sur les marges d'exportation extensive et intensive;
- le chemin suivi par l'ensemble des stratégies dynamiques entreprises dans le passé (l'ajout ou la réduction de l'ensemble de stratégies, c.-à-d., la mise à niveau/déclassement des chemins) a des effets supplémentaires sur l'attitude internationale des entreprises;
- parmi les différents types d'innovations, les nouveaux produits dominent d'autres formes d'innovation (processus ou organisation-gestion), en particulier dans le cas des sociétés précédemment non exportatrices;
- les innovations organisationnelles et des processus ont un effet indirect supplémentaire sur l'exportation en stimulant la productivité des entreprises;
- les stratégies novatrices ont des effets disproportionnés pour les performances internationales des sociétés (à l'origine) moins productives et des petites firmes, soulignant l'innovation comme un potentiel outil pour combler l'écart entre les grandes/productives entreprises et l'ensemble des entreprises moins structurées, un segment qui représentent une cible idéale pour des mesures politiques.

Nous avons également étudié les **principaux déterminants de l'innovation des entreprises** au moyen d'un modèle d'équations simultanées reliant l'innovation récursive avec les activités d'exportation. À cet égard :

- les caractéristiques structurelles affectent de manière significative l'introduction d'innovations, en particulier pour les entreprises plus grandes, plus jeunes et plus productives;
- l'existence de projets de R&D est clairement corrélée aux énormes augmentations de la probabilité d'introduire des innovations qui en résulte;
- cet effet ne se limite pas à l'investissement dans la R&D réalisé au sein de l'entreprise (R&D interne), mais s'étend aux entreprises qui sous-traitent les activités de R&D, même si avec des amplitudes plus réduites;
- l'environnement d'exploitation d'une entreprise, tels que l'affiliation à un groupe d'entreprises et l'établissement de relations étroites avec d'autres entreprises nationales, est un facteur critique supplémentaire dans la conduite des activités novatrices des entreprises;
- les contraintes financières influent de manière significative la capacité d'innovation d'une entreprise et l'établissement de liens étroits avec la banque principale est considéré comme extrêmement important pour réduire les asymétries d'information pénalisant les PME innovantes.

En outre, nous constatons que **la participation aux chaînes de valeur mondiales (CVM) a un effet positif sur l'innovation et la performance des entreprises**. Toutefois, nous soulignons les hétérogénéités pertinentes à la façon dont les participants des CVM ont ressorti la crise, en fonction du type de relation qui se déroule. Alors que les fournisseurs hautement qualifié qui sont impliqués, sans subordination, dans les processus de production de CVM affichent une forte propension à s'engager dans des activités d'innovation et la R&D, d'autres modes de participation des CVM n'ont pas de prime par rapport aux entreprises nationales. Cette hétérogénéité se reflète aussi dans la productivité et la croissance des ventes. Par rapport aux tendances antérieures à la crise, nous documentons un choc sévère de la demande pour les entreprises peu qualifiées et subordonnées, tandis que les "entreprises relationnelles" dans les CVM semblent être quelque peu à l'abri des effets de la crise.

Dans l'ensemble, donc, **la contribution principale de notre travail au débat sur la compétitivité extérieure italienne souligne l'importance de facteurs comportementaux et stratégiques dans l'élaboration des avantages concurrentiels au niveau de l'entreprise**. Bien qu'il n'y ait pas de doute quant à l'importance des caractéristiques structurelles, telles que la taille et la productivité, nos résultats soulignent également la présence de différents phénomènes stimulant l'internationalisation de l'entreprise. Parmi ces derniers, l'innovation et la R&D jouent un rôle crucial et se révèlent affecter la compétitivité extérieure directement et par des améliorations de productivité. **Même si l'effet positif des activités innovantes et de la R&D n'est certes pas nouveau, nous explorons plusieurs nouveaux niveaux d'hétérogénéité, ainsi que les effets indirects, qui peuvent constituer une base solide pour la construction d'implications politiques granulaires**. En particulier, les analyses permettent d'identifier des segments visés aux entreprises potentiellement innovantes avec les plus hauts gains escomptés de l'activité internationale. Tous ces résultats, lorsque lu à la lumière de l'ensemble mauvaises performances italiennes, suggèrent que **les faiblesses du système industriel ne sont pas strictement liées à ses compositions des classes de taille et secteurs**. En fait, des analyses comparatives soulignent que l'une des carences les plus influentes des micro-entreprises italiennes réside dans leur capacité d'innovation, plutôt qu'à leur large diffusion. De plus, conformément à ce qui a été souligné par de nombreux chercheurs, nos témoignages semblent confirmer le processus de restructuration entrepris par des nombreuses entreprises, se traduisant en un repositionnement et une mise à niveau stratégique de la production et des segments de marché.

Nous pouvons donc en tirer des implications politiques:

- le soutien à la R&D et l'innovation des entreprises devrait rester l'un de l'objectif principale des politiques de compétitivité. Le choix des instruments doit explicitement prendre en compte les besoins et les contraintes des entreprises ciblées;
- une question essentielle du travail est représentée par la recherche d'effets différentiels liés à l'intégration de trois stratégies dynamiques fondamentales (R&D, innovation et internationalisation), par lequel l'effet de l'intégration des stratégies dynamiques par les entreprises suivant un chemin de modernisation qui n'est pas encore complété semble être très important. L'achèvement de cette stratégie et l'intégration des activités se caractérisent - à notre avis - comme l'un des principaux objectifs d'une stratégie visant à soutenir la croissance des entreprises et à améliorer la compétitivité internationale. Les mesures politiques doivent viser spécifiquement ces objectifs;
- suivant la même logique, l'élimination ou la réduction de la discontinuité dans les activités commerciales stratégiques (par exemple en ce qui concerne la présence intermittente sur les marchés étrangers ou les activités innovantes et de la R&D discontinues), en particulier des plus petites entreprises, semble représenter un fin politique "efficace". La discontinuité peut être directement influencés par des mesures politiques spécifiques et appropriées;
- les contraintes financières constituent encore une limitation importante à la croissance des entreprises les plus dynamiques et à l'amélioration de leurs stratégies de développement; paradoxalement ce lien est plus fort pour les entreprises orientées vers l'innovation et la R&D que celles statiques à cause de l'élévée risque au niveau du marché et de la technologique et des demandes de crédit majeures: l'accès au crédit (ainsi qu'autres instruments financiers) pourraient avoir une orientation spécifique vers des projets innovants, tandis que la politique actuelle d'accès au crédit et du support de capitaux est plutôt axée sur le ciblage générale;
- le rôle du capital humain émerge faiblement comme une contrainte et comme un facteur de compétitivité dans les estimations et les élaborations précédentes, même si elles ne sont pas détaillées. Cependant, il est clair que les politiques fortement axé sur la R&D et les processus innovateurs ne peuvent ignorer la croissance du savoir et facilitent les efforts des entreprises dans l'amélioration des ressources humaines.

1 INTRODUCTION

Italy's external competitiveness and export performance has been a much researched and widely debated topic in recent years. The debate centres on the appraisal of the Italian competitive position. On the one hand, some scholars emphasise that the decline of the Italian export market share follows from a decreasing degree of national competitiveness. According to this perspective, the drop in the share of Italian exports is linked to the deterioration of cost competitiveness indicators (e.g. unit labour costs, real effective exchange rates etc.), mainly due to stagnant productivity dynamics (Hassan and Ottaviano, 2013). This issue has been often ascribed to the excessive presence of micro- and small- firms within the Italian industrial population (Barba Navaretti et al., 2011; Bugamelli et al., 2012; Pellegrino and Zingales, 2014), coupled with a low propensity to innovate and undertake R&D activities (Faini and Sapir, 2005; Bugamelli et al., 2012). The latter being typically seen to stem from the Italian specialisation in traditional goods and low-tech productions (Faini and Sapir, 2005). On top of that, Italian companies are often seen to have a relative disadvantage because of their subordinated positions along the global value chains (Accetturo and Giunta, 2016). Within this “pessimistic” perspective, the high degree of fragmentation of the industrial population is also coupled with an insufficient resorting to external management, often bound to the family dimension of many business companies (Bugamelli et al., 2012; Pellegrino and Zingales, 2014; Lippi and Schivardi, 2014).⁶ Moreover, several scholars highlight the aggregate inefficiencies connected with the institutional setting stemming from administrative inefficiencies (Giordano et al., 2015; Lanau and Topalova, 2016), market rigidities leading to misallocation (Calligaris et al., 2016; Gopinath et al., 2017), and the labour market reforms implemented during the 90s (Larch, 2004; Daveri and Parisi, 2015).

On the other hand, an alternative view underlines the presence of highly competitive segments embedded within an extremely-heterogeneous industrial system. Some scholars highlighted that Italy's international performances appear to have experienced stable trends over the recent years when compared with its main European competitors (Lanza and Quintieri, 2007; CSC, 2010, 2011). Among these more optimistic perspective showing the heterogeneous dynamics of firms' performances and strategies (Arrighetti and Traù 2012; Brancati, 2015), several works stressed the ongoing presence of major restructuring processes: the latter dealt with the repositioning of many firms within market segments characterised by higher value added, the improvement of the product quality, and, more in general, an increasing effort of the firms in adapting to the fast-evolving competitive scenario (De Nardis and Pensa, 2004; De Nardis and Traù, 2005; Cipolletta and De Nardis, 2012; Arrighetti and Ninni, 2014). These pressures have also been challenging the Italian districts, historically regarded as the engine of the Italian economic growth, triggering profound transformations in firms' internationalisation, innovation and organization strategies (De Marchi et al., 2013; Brancati et al., 2017). Under this perspective, the negative trends have to be re-interpreted within a worldwide scenario that led to an increasing pressure on international markets (e.g., the adoption of the Euro, the competition from developing countries, ICT revolution).

This work aims at contributing to this widely debated topic by adopting a firm-level perspective in order to take into account the heterogeneity of companies populating the Italian system.

The report contributes to the debate by providing an in-depth study on the relevant microeconomic factors underpinning the Italian external competitiveness and performance. The final goal is to add significant value to the understanding of Italy's competitive position and to help designing effective policy recommendations. There are several contributions of this work that is worth emphasising.

First of all, compared to most academic papers, our analysis does not focus on a single specific aspect, but rather takes on a broad approach encompassing a wide range of dimensions of external

⁶ In this regard, it is worth reminding that our comparison (between family firms run by a family member and by external management), which is carried out on a panel of ISTAT data covering the period 2011-2014, seems to go against this result in terms of value added, employment, and turnover growth rates.

competitiveness, ranging from aggregate dynamics, to firm-level determinants of export probabilities, shares, and actual performances. This is a critical issue if potential drivers have heterogeneous impacts on different dimensions.

Second, we exploit a huge amount of information in the recent crisis based on different data-sources. This is essential to dig deeper into the high degree of heterogeneity characterizing the Italian industrial system. Moreover, the use of up-to-date data is paramount in studying firms' behaviours and strategies adopted during the Great Crisis. Indeed, the recent period came with deep changes of firms' strategies and performance leading to an increasing polarisation within the population of enterprises. In this complex and fast-evolving scenario, the use of newly-available datasets is critical to properly interpret and assess these structural developments, as well as designing a set of effective policy measures.

We take advantage of two main datasets. The first one includes the entire population of Italian manufacturing firms and is represented by the database '*Rapporto sulla competitività dei settori*' collected by the Italian Institute of Statistics (ISTAT). In particular, the database provides information on structural characteristics (employees, sector, geographical region, corporate group belonging, etc.) merged with other relevant economic variables (including value added, labour cost, export, import, etc.). In order to account for the multifaceted nature of competitiveness and to analyse firms' strategic profiles such as innovation, R&D, and networking relationships, we also exploit data from the MET sample survey on Italian firms. This survey is specifically conceived to study a massive amount of firms' characteristics and strategies, with a particular focus to their internationalisation and innovative patterns. The sampling scheme, ensuring a very high degree of representativeness once coupled with a large number of interviews, is stratified along three dimensions: sector, geographical region, and size class. Unlike many other firm-level databases, the MET survey also accounts for firms with less than ten employees representing the vast majority of companies within the Italian industrial system. The survey is made of five waves (2008, 2009, 2011, 2013, and 2015) and covers a time span starting right before the Lehman collapse until recent years. The population of interest includes the enterprises operating within either Industry (construction excluded) or Production Services sectors (38 NACE Rev.2 3 digit sectors), with a total number of interviews of 120,000 companies, roughly 24,000 observations per wave. In addition to survey information, MET firms are aligned with balance-sheet data, covering the entire population of Italian firms' balance sheet (CRIF-Cribis D&B) which, according to the Italian law, encompasses limited companies and cooperatives. However, being representative of the entire population, MET survey also includes other types of firms whose balance sheet are not publicly available.

Before presenting a brief outline of the main results, it is also worth highlighting some caveats to correctly interpret findings and derive some policy recommendations. First of all, the core of our study relates to firm-level analyses on the Italian manufacturing and, to a lesser extent, production services sectors, whereas the comparison with the other countries has been carried out for the aggregate descriptive statistics only. Furthermore, our analysis cannot be generalized to normal times, since it specifically focuses on recent years, with a time span embracing the 2008-2015 period, for the MET sample survey, and 2011-2014 for the ISTAT databases.⁷ As for the results, institutional and environmental factors, that might affect the external competitiveness, are typically regarded to be given (except for some dedicated boxes describing aggregated trends).

The econometric strategies, nevertheless, identifies effects of the observed variables of interest that are purged from all the time-, sector-, and firm- specific (unobserved) factors, such as the business cycle, aggregate demand, institutional context, and technological regimes. Clearly, this approach does not allow an identification of these effects. Moreover, as external competitiveness is a multifaceted phenomenon that needs a multitude of econometric analyses to be thoroughly investigated, some observed factors could not be unambiguously identified (for instance, because estimates of regional and sectoral dummies cannot to be interpreted in causal terms, they do not represent a sound base for

⁷ Moreover, due to privacy issues it was not possible to merge information from the two databases.

policy implications). Instead, the focus of the policy recommendations derived in this work is the identification of the main drivers of external competitiveness that are related to behaviours and strategies at the firm level, rather than more aggregate factors.

Italy has been suffering from a slow-growth trend that can be traced back since the 90s, long before the outbreak of the global recession. This dynamic might reflect many factors, including its lower openness to the international environment (even in comparison with other European countries of similar size) and the resulting limited exposure to the beneficial effects of global integration. This gap does not seem to stem from a lower degree of import penetration and export propensity (notwithstanding a significant gap with Germany), but rather from a reduced involvement in the international production processes.

Since 2010, the long-lasting decline of Italian export shares ceased, with the value of Italian exports experiencing a positive growth, roughly in line with the one for Germany, and even higher than other relevant peer economies such as France, UK, the Netherlands, and Belgium. This trend has been positively affected both by the geographical composition of the Italian export markets and by the favourable world demand for products of the Italian industrial specialisation. In this regard, it is worth emphasizing, however, that the Italian sectoral trade specialization has been going through a set of structural changes since the arrival of the new millennium. In particular, the comparative advantages of the Italian industry in traditional low-tech industries progressively dwindled, while, at the same time, the specialization of medium-technology products has been strengthening. In recent years, some non-traditional sectors, such as “Pharmaceuticals” and “Motor vehicles”, have significantly added on their relative weight over the total export composition. Furthermore, many traditional “Made in Italy” sectors (“Foods and Beverages” and “Textiles and Apparels”, among others) have increased their importance in terms of shares of total exports. These dynamics may be backed by an intra-sectoral restructuring following from a repositioning of a large number of Italian firms on market segments characterised by higher value-added levels (a consequence of which can also be pinpointed by the observed discrepancy between volumes and values of total exports).

One of the most discussed weaknesses of the Italian economy is linked to its low and stagnant labour productivity. Although negatively affecting the aggregate performance, productivity dynamics have not translated into a significant loss of price competitiveness with respect to the other major Eurozone countries, because offset by a significant wage moderation. Once the dynamics of labour productivity are broken down by size classes, a large degree of heterogeneity emerges among firms. In particular, the overall negative dynamics turn out to follow almost exclusively from the productivity of micro-sized (1-9 employees) and large (>250 employees) enterprises, ranking in the last positions if compared with the main European peer economies. Conversely, the overall picture significantly improves for firms above ten employees, with the class 20-249 employees that even outmatches other European counterparts in terms of productivity levels and recent growth trends. As such, our analyses suggest that one prominent weakness of the Italian economy has not to be traced back to the excessive number of micro-sized firms (whose share is comparable to France and Spain), but rather to their technical inefficiency compared to the micro-firms of other countries. The latter is strictly related to poor performances in terms of innovative behaviours, human capital absorption, and degree of international openness. At the same time, the analyses of the main non-price competitiveness indices by size class suggest that, excluding micro-sized firms, Italian trends are not far from other main European economies.

The analysis of firm-level data confirmed the high degree of heterogeneity of the Italian system and the well-known differences between internationalised and domestic companies along a wide range of structural, behavioural and performance dimensions (internationalised companies are typically larger, more productive, and more innovative than domestic firms). Since the outbreak of the crisis, data highlight a significant growth trend in terms of both extensive and intensive margins of export. The second wave of the crisis, characterised by a drop of the Italian domestic aggregate demand, has pushed an increasing number of firms to look abroad for new survival opportunities, especially micro-sized firms. Nevertheless, many of these companies turned out to be extremely weak and unable to sell persistently on foreign markets, thus, negatively affecting the overall aggregate performance.

Obviously, internationalisation is a heterogeneous phenomenon itself and its different forms entail diverse strategies associated with distinctive characteristics and behaviours. In particular, increasing complexity in the form of internationalisation is associated with higher degree of persistence on foreign markets and requires more complex structures to accomplish a wider range of tasks (e.g. knowledge of institutional and legal aspects of foreign countries, higher technological competition, etc.). To this extent, the more complex is the form of internationalisation the higher is the propensity to undertake innovative activities, to hire high skilled human capital and dedicated management.

On balance, the analyses of sample survey data have shown that, whilst size and productivity play a key role for external competitiveness, there are also other fundamental aspects triggering superior performances. In particular, a non-negligible part of heterogeneity stems from firms' strategic profiles, technological capabilities and 'proactive' behaviours, especially innovative activities. In this regard, we document a decreasing diffusion of the "traditional" Italian model characterised by incremental innovations without R&D activities. Moreover, after an initial collapse in the share of innovative firms, the Italian industrial system has been witnessing a gradual rebound in the diffusion of proactive firms after 2010-2011. In some of these cases, such as R&D activities, the share of firms involved in dynamic strategies in 2015 has even overtaken its pre-crisis value.

Within this framework, the econometric analysis emphasises the importance of both structural characteristics and strategic behaviours in determining firms' international performance. The empirical strategy, in order to correct unobserved heterogeneity, mainly employs random-effect *probit* models (with Mundlak correction) and within estimator (with firm and time fixed effects) to dig deeper into the drivers of external competitiveness, both in terms of extensive and intensive margins of export. Our analysis delivers a set of results with some important policy implications.

As expected, we confirm the presence of a self-selection mechanism of more productive companies into international markets. Although productivity is associated to higher likelihood of exporting, once accounted for persistent characteristics that do not vary over time, its role is found to be largely reduced in explaining the change in the exporting status. On the other hand, productivity has a critical impact on firms' international performance (i.e., intensive margins) and decision to exit the foreign markets. Moreover, other characteristics play a critical role in firms' export propensity, especially size and the affiliation to a corporate group. Finally, being an importer of intermediate products is largely associated to a higher probability of exporting, confirming how import policies may affect aggregate productivity, resource allocation, and industry export activity.

A critical driver for external competitiveness is found to be linked to firms' strategic behaviours and investment in dynamic strategies. The introduction of innovations, the involvement in R&D projects, as well as undertaking new investments, induce a significant positive effect on export strategies and performance. The introduction of innovations is even more important in reaching extra-EU destinations and in affecting firms' switching strategies (i.e., the choice of entry or exit the international market). Interestingly, on the top of their direct impact, there are significant cumulative effects of dynamic strategies. First, the integration of innovation and R&D activities implies *premia* on both the extensive and intensive margins of export. The coefficients of innovative strategies paired with R&D investment is two-to-three times larger than isolated innovations. Moreover, the path followed by the set of dynamic strategies undertaken in the past (adding or reducing the set of strategies, i.e., upgrading/downgrading paths) has additional effects on firms' international attitude. Among the different types of innovations, new products dominate other forms of innovativeness (process or organisational-managerial), especially in case of previously non-exporting companies. However, we find process and organisational innovations to have an additional indirect effect on export by boosting firms' productivity.

Furthermore, innovative strategies are found to have disproportionate effects for the international performance of (originally) less productive and small companies, pointing at innovativeness as a potential tool to fill the gap between large/productive companies and the set of less structured firms, a segment that represents an ideal target for policy measures.

A simultaneous equation model also explores the main determinants of firms' innovativeness. In this regard, structural characteristics significantly affect the introduction of innovations, especially for larger, younger, and more productive companies. The existence of R&D projects is clearly correlated to huge increases in the probability of introducing innovations. Importantly, this effect is not limited to the investment in R&D performed within the firm (internal R&D), but extends to firms outsourcing R&D activities, even though with smaller magnitudes. This evidence emphasises the importance of research-oriented networks to overcome the lower innovativeness of less-structured companies. Another critical factor in driving firm innovative activity is related to the operating environment of a company, such as the affiliation to a corporate group and the establishment of close relationships with other domestic enterprises. Finally, financial constraints are found to significantly affect a firm's capacity to innovate and the establishment of close ties with the main bank is documented to be extremely important in reducing informational asymmetries penalizing innovative SMEs.

Moreover, we find that the participation in Global Value Chains (GVC) exerts a positive effect on firms' innovativeness and performance. However, we emphasise relevant heterogeneities in how GVC participants fared the crisis, based on the type of relationship that takes place. While high-skill suppliers that are involved, without subordination, in GVC production processes display a significant propensity to engage in innovative activities and R&D projects, other modes of GVC involvement have no premium compared to domestic companies. This heterogeneity is also reflected in differential productivity and sales growth. Compared to the pre-crisis trends, we document a severe demand shock for low-skill and subordinated firms, while relational GVCs appear to be somewhat sheltered from the effects of the crisis.

Overall, we contribute to the debate on Italian external competitiveness by pointing out the importance of behavioural and strategic factors in shaping firm-level competitive advantages. Whilst our results confirm the effect of structural characteristics, such as size and productivity, they also highlight the existence of different phenomena boosting firm internationalization. Among these, innovation and R&D play a crucial role and turn out to affect external competitiveness both directly and via productivity improvements. Even though the positive effect of innovative activities and R&D is certainly not new, we explore several new levels of heterogeneity, as well as indirect effects, that may provide a sound base for the construction of granular policy implications. In particular, the analyses allow for the identification of targeted segments of potentially innovative companies with the highest expected gains from the international activity.

All these results suggest that the weaknesses of the industrial system are not exclusively bound to its size-class and sector compositions. As a matter of fact, comparative analyses stress that an influent shortcoming of Italian micro-sized firms lies in their specific innovative capacity, rather than only in their large diffusion. However, our findings seem to confirm the existence of ongoing restructuring processes undertaken by an increasing number of companies, translating into a repositioning and a strategic upgrading along the production and market segments.

Pairing this information with constraints and weaknesses permits to derive the following set of policy implications.

The set of results is extremely wide and deals with a significant number of dimensions that enrich the existing literature and provide nontrivial suggestions for future policies. Coherently with the main interpretations on the Italian international performance, and given the aforementioned caveats in the analysis undertaken, the main findings and policy suggestions can be grouped into four main areas of contents.

Productivity

We confirm the critical role played by productivity for international competitiveness, which is paired with higher likelihood of internationalisation: a one-standard deviation increase in productivity is associated to a 1.5% higher probability of export. This evidence is consistent with the literature emphasizing a self-selection of companies in the international markets and with the descriptive statistics showed. Moreover, productivity has a critical impact on firms' international performance (i.e., intensive margins) and on the decision to exit the foreign markets (+4% export sales growth and -2% probability of going back domestic). This is a critical issue since firms' exit from international markets, as documented by aggregate descriptive statistics, has been extremely sizable (roughly 20% of internationalised companies between 2011 and 2014) even in times of relatively low domestic demand.

However, once accounted for persistent characteristics that do not vary over time (including the higher average productivity of some companies), productivity is found to be largely insignificant in explaining the change in firms' exporting status for domestic enterprises. The new entry into international markets, also in absence of R&D and innovation, has a particularly virtuous effect on sales performance.

In the light of our findings, productivity represents an essential driver for the success and the permanence on the international markets, but is not found to be a significant driver of new internationalisation choices (i.e., new entrances). In this regard, policy measures should account for such a heterogeneous effect differentiating between interventions aimed at increasing the number of internationalised companies (a relevant issue for the growth of competitiveness through learning-by-exporting mechanisms) and the measures oriented to strengthening of the international position and performance of previously-internationalised companies.

Research and innovation

On the top of structural characteristics, a prominent effect is found for firms' strategic behaviours and investment in dynamic strategies. The introduction of innovations, the involvement in R&D projects, as well as undertaking new investments, induce a significant effect on export strategies (roughly +2% in export probability) and performance (innovations induce on average a 8%-increase of export sales growth).

The introduction of innovations is even more important in reaching extra-EU destinations and in affecting firms' switching strategies; i.e., entrance (+2.3%) and exit (-8.5%) from the international markets.

On the top of their direct impact, there are significant cumulative effects of dynamic strategies. First, the integration of Innovation and R&D activities implies *premia* on both the extensive and intensive margins of export. The coefficients of innovative strategies paired with R&D investment is two-to-three times larger than isolated innovations (4.1% vs 1.7% in the probability of export, and +11.7% vs +6.6% in export sales growth). Moreover, the path followed by the set of dynamic strategies undertaken in the past (adding or reducing the set of strategies, i.e., upgrading/downgrading paths) has additional effects on firms' international attitude (roughly, +5% probability of exporting).

Among the different types of innovations, new products dominate other forms of innovativeness (process or organisational-managerial), especially in case of previously non-exporting companies (4%-higher probability of exporting). This is because new products are the main form of innovation which is not reflected in the level of productivity. However, we find process and organisational innovations to have an additional indirect effect on export by boosting firms' productivity (+2% productivity growth, +15% if based on matching techniques), while the introduction of new products does not seem to be linked to any productivity growth.

Innovative strategies are found to have disproportionate effects for the international performance of (originally) less productive and small companies: 17%- and 21%-increase in export growth compared to

7%- and 8%-increase for more productive and larger firms, respectively. This result candidates innovative strategies as a potential tool to fill the gap between large/productive companies and the set of less structured firms, that are ideal targets for policy measures.

A simultaneous equation model (bivariate *probit*) also emphasizes the main determinants of firms' innovativeness. In this regard, structural characteristics are significantly affecting the introduction of innovations, especially for larger, younger, and more productive companies. The existence of R&D projects is clearly correlated to huge increases in the probability of introducing innovations. Importantly, this effect is not limited to the investment in R&D performed within the firm (internal R&D), but extends to firms outsourcing R&D activities, even though with smaller magnitudes (+8% vs +27% probabilities). Another important factor in driving firms' innovativeness is related to the operating environment of a firm, such as the affiliation to a corporate group (+5%) and the establishment of close relationships with other domestic companies (i.e., networks, +4.5%). Finally, financial constraints are found to significantly affect a firm's capacity to innovate and the establishment of close ties with the main bank is documented to be extremely important in reducing informational asymmetries penalizing innovative SMEs.

In terms of policy recommendations, we confirm the critical role played by R&D and innovations (new products directly influencing international competitiveness, and process/organizational innovations operating through higher productivity growth). Our analysis sheds lights on some interesting factors. First of all, we show disproportionate effects of dynamic strategies for more fragile (smaller and less productive) companies that are paired with a premium linked to integrated strategies (innovation and R&D) and the documented need to reduce the discontinuity of proactive behaviours, typically characterizing more fragile (and often smaller) companies. These issues should be all taken into account when designing specific policies.

Similarly, financial constraints severely limit the activity of potentially innovative firms. Their role goes beyond generic frictions in the credit market, such as informational asymmetries affecting the entire set of relationships of SMEs with the banking system, and is dramatically exacerbated in presence of direct funds to innovative projects (characterized by higher uncertainty, opacity, and typically associated to investment in immaterial capital that cannot be pledged as collateral).

Firm size and corporate groups

The dominant view on the Italian productive system emphasises the excessive number of micro-sized companies within the economy, as well as a very fragmented industry paired with a reduced diffusion of large enterprises. Our analyses and the available comparisons allow to draw a more detailed picture of the industrial system.

The few external econometric analyses on firm-level information are not adequately capable of capturing the role of micro-sides companies because mainly based on survey data excluding very small firms from the sample design.

Aggregate descriptive statistics seem to document that the main weakness of the Italian system has not to be ascribed to the excessive diffusion of micro firms (whose share is not far from the one in France and Spain), but rather to their relatively poor performance. Our analysis suggests that the heterogeneity of the set of dynamic strategies adopted leads, even within the same size class, to substantially different economic outcomes and efficiency levels. Moreover, within the class of small firms there is a significant difference between companies below and above ten employees. For the latter (>10), descriptive and empirical evidence emphasises higher performance of Italy compared to other European peer economies.

The econometric analyses always confirm the positive role of size and affiliation to corporate groups (respectively, +3% and +2% probability of exporting). In this regard, however, innovative strategies seem to display disproportionate incremental effects for smaller companies.

Obviously, firms' size cannot be easily implemented as a specific objective for policies, at least not directly. It is however clear from the empirical results that policy measures oriented to the reinforcement of innovative and knowledge-creating activities, to the reduction of their discontinuity, and the specific financial constraints to their implementation may explicitly help smaller firms that are willing to undertake dynamic paths.

Industrial networks and global value chains

The role played by networks of firms and industrial districts is central in the economic literature on the Italian system. It has been often pushed forward as a factor capable of offsetting the inefficiencies of small firms by allowing to reach a larger scale at the network level compared to the small dimension of the single units. Similarly, firms' involvement in Global Value Chains is often cited as a determinant factor in explaining success and weakness on the international markets, depending on their diffusion and the different modes of participation of the firms involved.

Our analysis confirms the role of local networks in increasing firm innovativeness, through the opportunity of knowledge exchanges, as well as the effect of GVC belonging. Our findings provide evidence of a positive average impact of the involvement in GVCs, but highlights at the same time relevant heterogeneities in how GVC participants fared the crisis. While high-skill suppliers with stable international connections (i.e. "relational GVCs") display a significant propensity to engage in innovative activities and R&D projects, other modes of GVC participation have no premium compared to domestic companies. This heterogeneity is also reflected in differential productivity and sales growth. Compared to the pre-crisis trends, we document a severe demand shock for low-skill and subordinated firms, while upgraded positions in GVCs appear to be somewhat sheltered from the effects of the crisis. Overall, while upgrading in GVCs has to operate through the stable implementation/increase of R&D and innovative activities, the strengthening of local networks can be seen as a positive element for the reinforcement of existing strategies. Overall, upgrading dynamic strategies come out as the critical factor also within the district and GVC framework, even above sector-specific components.

All in all, provided that our analysis does not specifically explore the effect of macroeconomic policies and structural reforms, the key elements in terms of policy suggestions to be derived from our work and estimates can be summarized as follows:

- the support to firms' R&D and innovation should keep being one of the main focus of policies for competitiveness. The choice of instruments has to explicitly consider needs and constraints of the targeted businesses;
- an essential issue of the work is represented by the research of differential effects due to the integration of three fundamental dynamic strategies (R&D, innovation and internationalisation), whereby the effect of integrating dynamic strategies by firms following a path of modernisation that is not yet completed appears to be very significant. The completion of this strategy and the integration of activities is characterized - in our view - as one of the main goal of a strategy to support firms' growth and to improve international competitiveness. Policy measures must be specifically targeted to these goals;
- on the same logical trail, the elimination or reduction of discontinuity in strategic business activities (for example with reference to the intermittent presence on foreign markets or with discontinuous innovative activities and R&D), in particular of smaller enterprises, seems to represent an "effective" policy target. The discontinuity can be directly influenced by appropriate and specific policy measures;
- financial constraints still constitute a substantial limitation to the growth of the most dynamic companies and to the improvement of their development strategies; paradoxically this bond is stronger for companies oriented towards innovation and R&D than the static ones because of the significant market and technological risk and for the higher credit demand: access to credit (as well as other financial instruments) could usefully have a specific orientation towards

innovative projects, while the practice of current policy for credit access and equity support is more in the sense of general targeting;

- the role of human capital as a constraint and as a driver for competitiveness weakly emerges in the estimates and elaborations (even when not explicitly detailed). However, it is clear that strongly focused policies on R&D and innovative processes cannot ignore knowledge growth and facilitate firms' efforts in human resources improvement.

The remainder of the report is organized as follows. Section 2 presents some background evidence on the performance of the Italian productive system. This section provides a picture of the main indicators of external competitiveness and aggregate dynamics, also highlighting some key features of the Italian economy that may help explaining differential firm behaviours. Section 3 introduces the related literature with a specific focus on the main policy-oriented academic contributions in the field of firm-level drivers of external competitiveness, by devoting particular attention to the large body of research analysing Italian companies. Section 4 investigates heterogeneities in the drivers of external competitiveness. In particular, the analyses devote attention to explorative statistics highlighting the main characteristics, performances, and strategies correlated with the firms' propensity to export. Section 5 further analyses heterogeneities within internationalized companies in order to pinpoint the factors connected with the different internationalisation modes (e.g., export, import, multinationals, etc.). Section 6 presents the econometric analyses to shed light on some causal nexuses driving the international propensity and performance. Section 7 provides some hints about the effect of the financial crisis on the competitiveness of Italian firms with a special focus on the dynamics of the drivers identified through econometric techniques. Finally, Section 8 takes advantage of the main findings to draw policy recommendations aimed at fostering the competitiveness of the Italian industry.

2 BACKGROUND EVIDENCE

This section explores the background scenario by presenting some key statistics on the comparative performance of the Italian productive system. It is aimed at providing a picture of the external competitiveness and aggregate dynamics, as well as a motivation for the empirical analyses carried on in the following sections.

The main results can be summarised as follows:

- The Great Crisis was particularly severe in Italy, albeit its GDP was growing more slowly than the Eurozone average even before 2008. The current recovery is weak and the volume of production is still well below the pre-crisis levels.
- In the second phase of the crisis, domestic demand experienced a collapse, falling at an average annual rate of 3% between 2010 and 2013, whereas exporters struggled in competing on the international markets.
- The slow growth of the Italian economy might reflect its limited exposure to the beneficial effects of international integration. In comparison with other European countries of similar size, the Italian economy is less open especially for what regards the international production whilst the gap is not huge in terms of export propensity or import penetration.
- Even before the global recession, the average export growth rate of Italian goods and services had been lower than the Euro area and the world average, although, during the second phase of the crisis, the fall of the Italian exports as a share of the world trade stopped.
- Since 2010, the value of Italian exports experienced a positive growth not far from the German ones and higher than other relevant peer economies such as France, UK, the Netherlands and Belgium. The trend of these last years has been positively affected both by the geographical composition of the Italian export markets and by the increment of the world demand for the type of products characterising the Italian sectoral specialisation.
- The Italian sectoral trade specialization has been going through a set of structural changes since the arrival of the new millennium. In particular, the comparative advantages of the Italian industry in traditional low-tech industries progressively dwindled, while, at the same time, the specialization medium-technology products has been strengthening.
- Italian recent export performance appears slightly better when it is valued at current prices, rather than in volume terms. This discrepancy might follow from the repositioning of many Italian firms along higher value added market segments.
- The negative dynamic of labour productivity has not translated into a significant loss of price competitiveness with respect to the other major Eurozone countries, because it has been offset by wage moderation. Hence, market share losses of Italian exports with respect to the Eurozone average should not be traced back to problems of price competitiveness.
- At the aggregate level the analyses of the main non-price competitiveness indices reveal a sensitive gap between Italy and its European peer economies. In particular differences relate to R&D expenditures, propensity to innovate and the employment of skilled labour (due both to a lack of supply and of demand).
- Nevertheless, once broken down by size-class, the analyses highlight that this gap is mainly linked to the characteristics of the smallest firms (less than 10 employees). Indeed, by excluding micro-sized firms the innovation and R&D propensities of Italian companies are not far from those shown by the other main European economies.

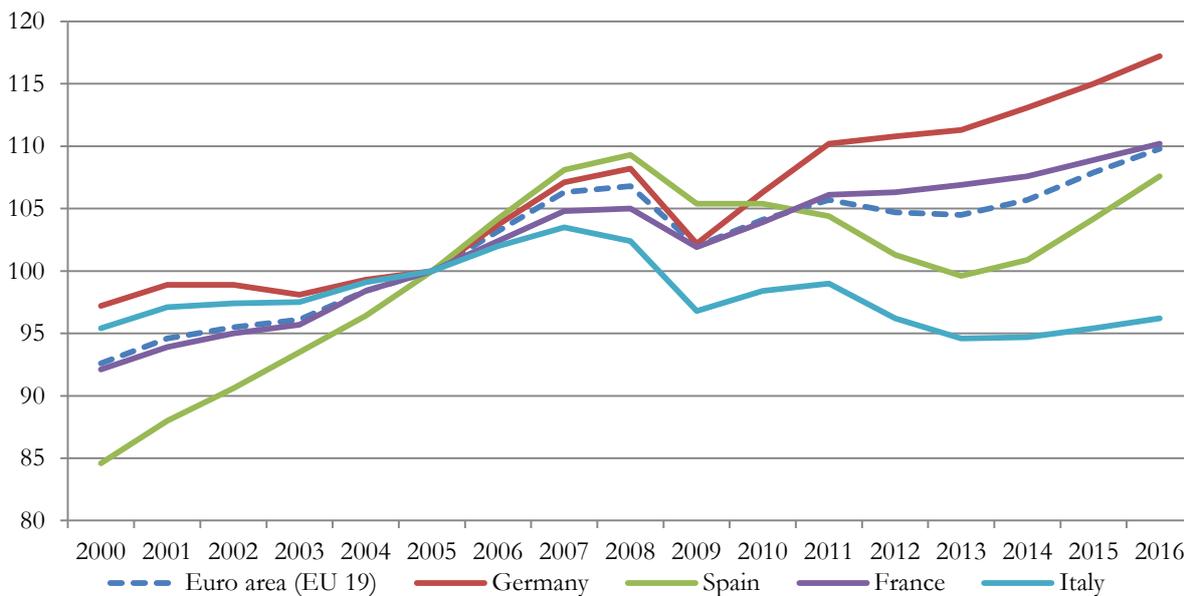
- In Italy the share of micro-sized exporters is comparable to the ones detected in its European peer economies (France, Spain and Germany). Nevertheless, their contribution to the overall value of exports is significantly smaller. On the contrary, when focusing on the ‘10-49’ and ‘50-249’ size classes, the intensive margin of exports (i.e., the average value of exports per firm) of Italian companies is particularly high, revealing their prominent degree of external competitiveness.

Economic growth and international openness

The Great Crisis was particularly severe in Italy, but its GDP was growing more slowly than the Eurozone average even before 2009. The current recovery is weak and the volume of production is still well below the pre-crisis levels.

In the second phase of the crisis, domestic demand experienced a collapse, falling at an average annual rate of 3% between 2010 and 2013, whereas exporters struggled in competing on the international markets.

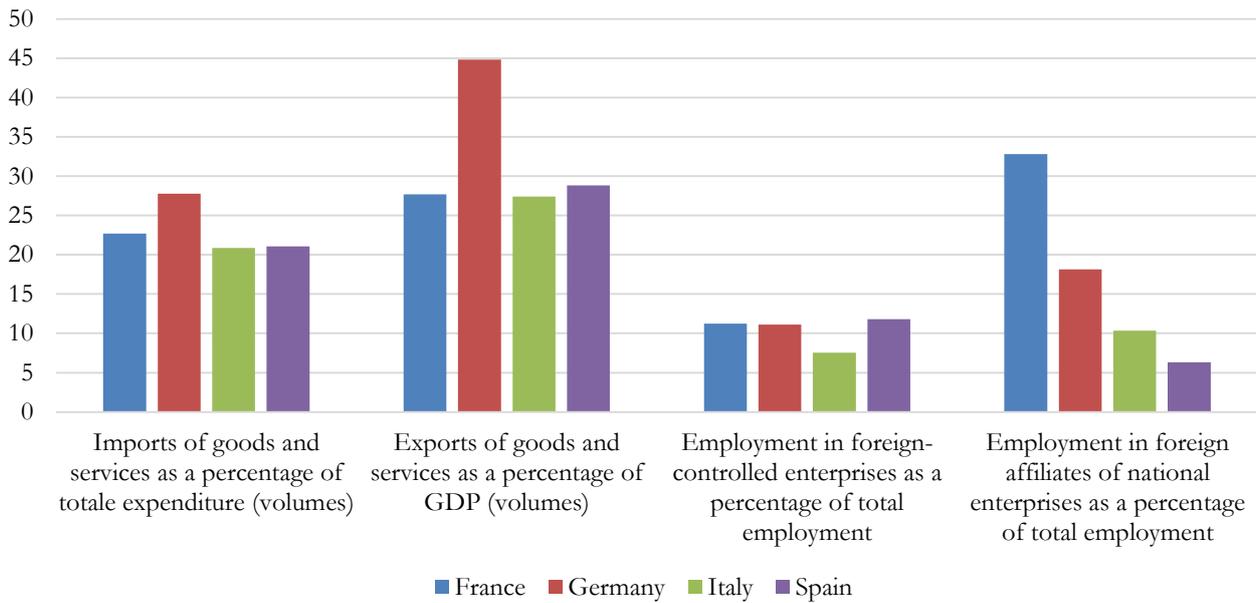
Figure B.1: Real GDP Chain linked volumes (2005=100)



Source: EUROSTAT

To a certain extent, the slow growth of the Italian economy might reflect its limited exposure to the beneficial effects of international integration. In comparison with other European countries of similar size, the Italian economy is less open. This gap is not huge in terms of export propensity or import penetration, even if Italy ranks slightly below the other major Eurozone countries in both these indicators, but it is extremely sizeable for what regards international production. On the one hand, the foreign presence of Italian multinationals (in terms of employees) is much smaller than in France and Germany. On the other, the foreign-controlled share of Italian employment is lower than in all the other major Eurozone countries, indicating a limited ability to attract foreign direct investment (FDI).

Figure B.2: International economic openness - average 2010-14

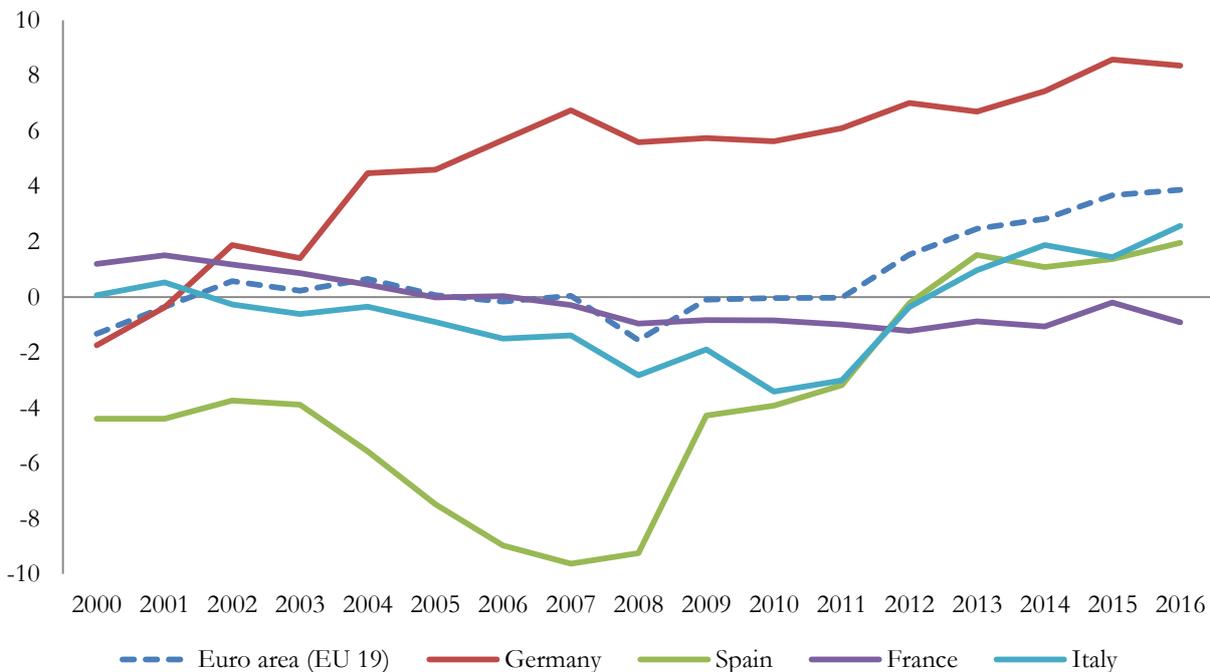


Source: elaborations on OECD Economic Outlook and Eurostat FATS data.

Current account balance, domestic demand and export performance

The international position of the Italian economy, as measured by the current account balance, after a long period of decline has been improving since 2011, following a path similar to that of Spain and benefiting from the fall in the price of raw materials.

Figure B.3: Current account balance as percentage of GDP.

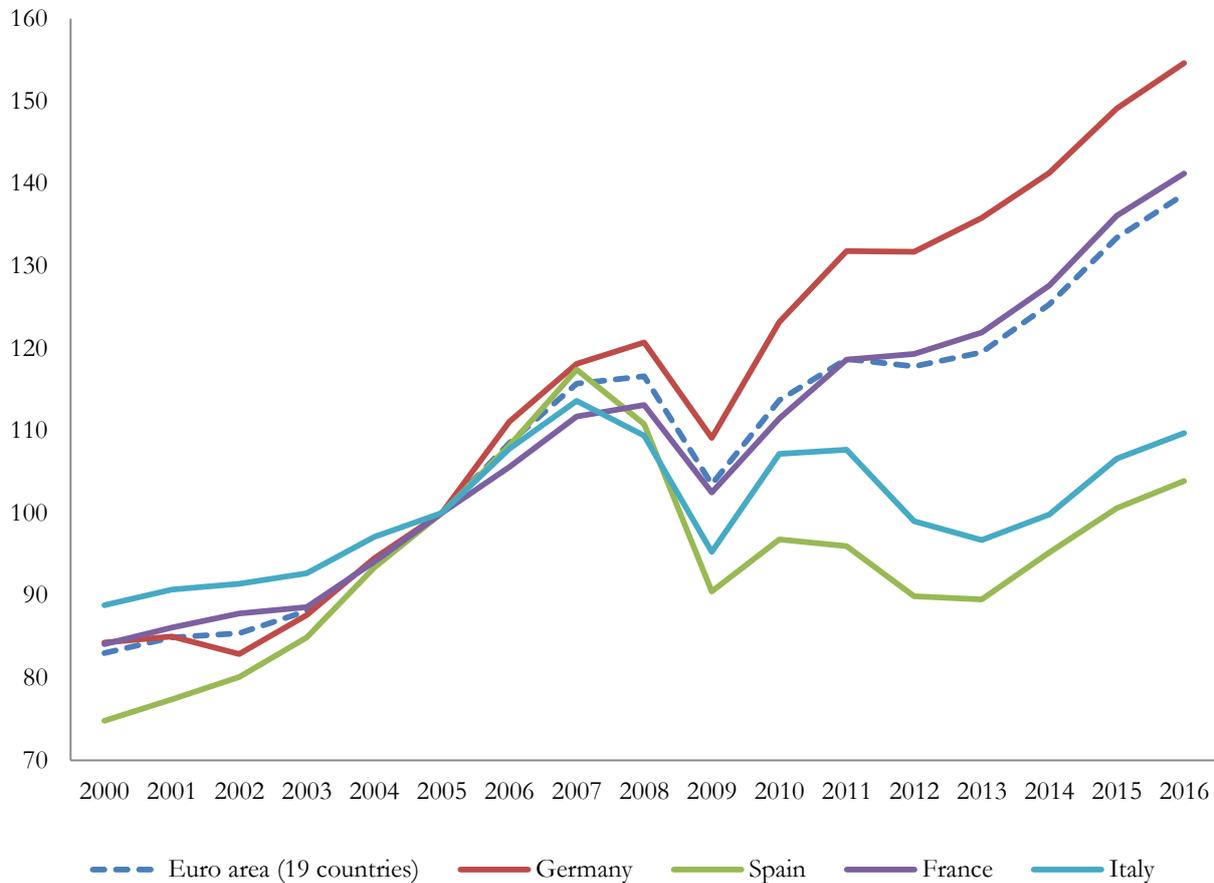


Source: OECD

In Italy and Spain the rebound of the current account has been prompted by the collapse of domestic demand, which has cut import growth. In both countries, notwithstanding the recent recovery, the

volume of imports of goods and services in 2016 was still below its pre-crisis level, which marks a strong difference with respect to France, Germany, and the Euro area average.

Figure B.4: Imports of goods and services, chain linked volumes - index (2005=100).



Source: EUROSTAT

Even before the global recession, the average export growth rate of Italian goods and services had been lower than the Euro area and the world average, although Italy performed slightly better than France. The impact of the first wave of the crisis was much harsher for Italy than for all the other major Euro area countries. In the following years, since 2011, Italian export performance has remained limited, despite the stimulus coming from the euro depreciation, which has pushed Euro area export growth rates above the world average. The problem is particularly evident for the exports of services but, even limiting the analysis to goods, Italian exports kept being below other Euro area countries, except France.

Table B.1: Exports of goods and services, average annual growth rates.

	Chain linked volumes			Values in million euros		
	2001-07	2008-10	2011-16	2001-07	2008-10	2011-16
Goods						
France	3.1	-1.3	3.0	3.2	-1.2	3.2
Germany	7.4	-0.6	4.0	7.4	-0.3	4.5
Italy	3.5	-3.5	3.1	5.0	-2.7	3.8
Spain	4.4	-0.5	4.4	5.9	0.1	4.9
Euro area (19 countries)	5.3	-0.9	3.9	5.9	-0.5	4.2
World	6.5	1.4	3.4	5.5	4.2	4.0
Services						
France	2.5	0.1	5.4	4.1	1.8	5.9
Germany	7.0	3.5	4.9	7.9	3.7	6.0
Italy	1.8	-5.3	2.0	4.0	-3.8	3.2
Spain	2.8	-2.6	4.2	6.2	-0.9	5.1
Euro area (19 countries)	4.4	1.0	5.0	6.6	2.3	6.2
World	n.a.	n.a.	n.a.	6.4	4.1	6.8
Goods and services						
France	3.0	-1.0	3.6	3.4	-0.5	3.9
Germany	7.3	0.1	4.1	7.5	0.3	4.8
Italy	3.1	-3.9	2.9	4.8	-2.9	3.7
Spain	3.9	-1.2	4.3	6.0	-0.2	4.9
Euro area (19 countries)	5.1	-0.5	4.2	6.0	0.1	4.7
World	6.5	1.3	3.7	5.7	4.1	4.6

Source: Eurostat, IMF World Economic Outlook, UNCTAD and WTO

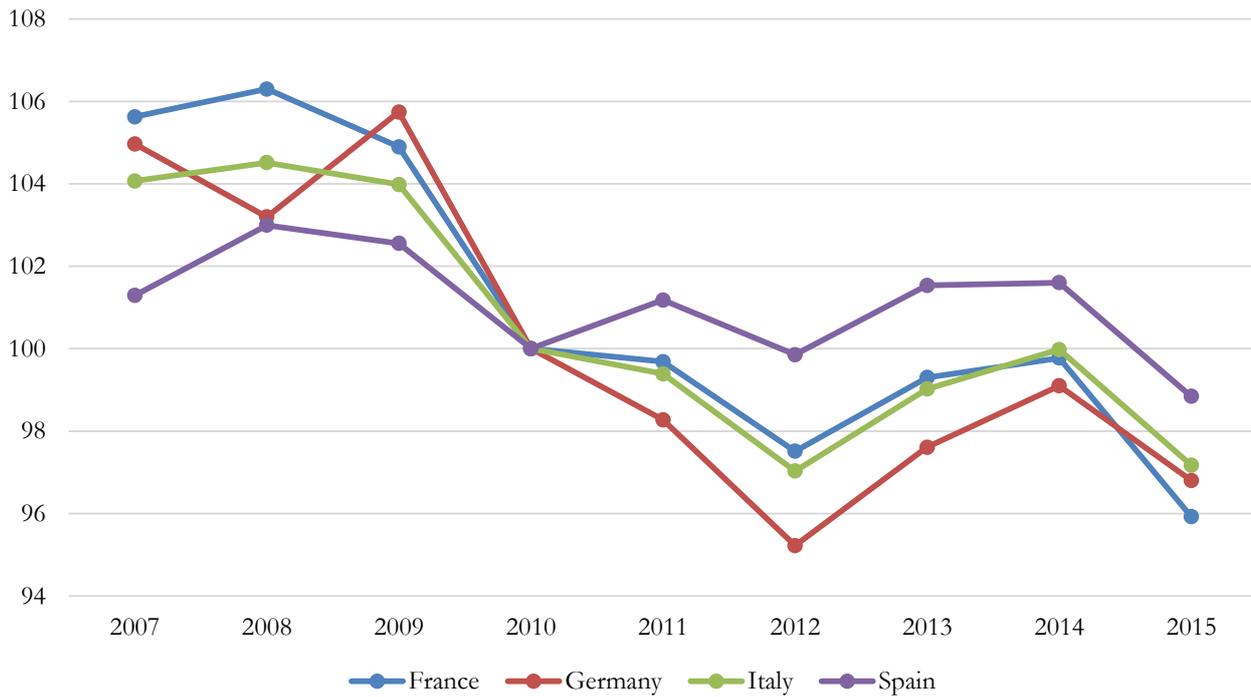
Italian recent export performance appears slightly better when it is valued at current prices, rather than in volume terms. The gap between Italy and the Euro area averages appears smaller, especially for exports of goods. This evidence, on the one hand, points at a less favourable implicit real exchange rate; on the other, it could also be due to an upgrading in the relative quality of Italian exports (see following sections for further analyses).

Real exchange rates and labour productivity

Real effective exchange rates (REERs) are often expressed in terms of consumer prices, which however include profit margins in the retail distribution sector and do not allow to properly assess the competitiveness of producing firms. A better measure is given by REERs in terms of producer prices, which reflect cost factors as well as the pricing strategies of firms.

Overall, the price competitiveness of Italian products has improved during the crisis, as an effect of the euro depreciation, in line with what occurred in the other major Eurozone countries.

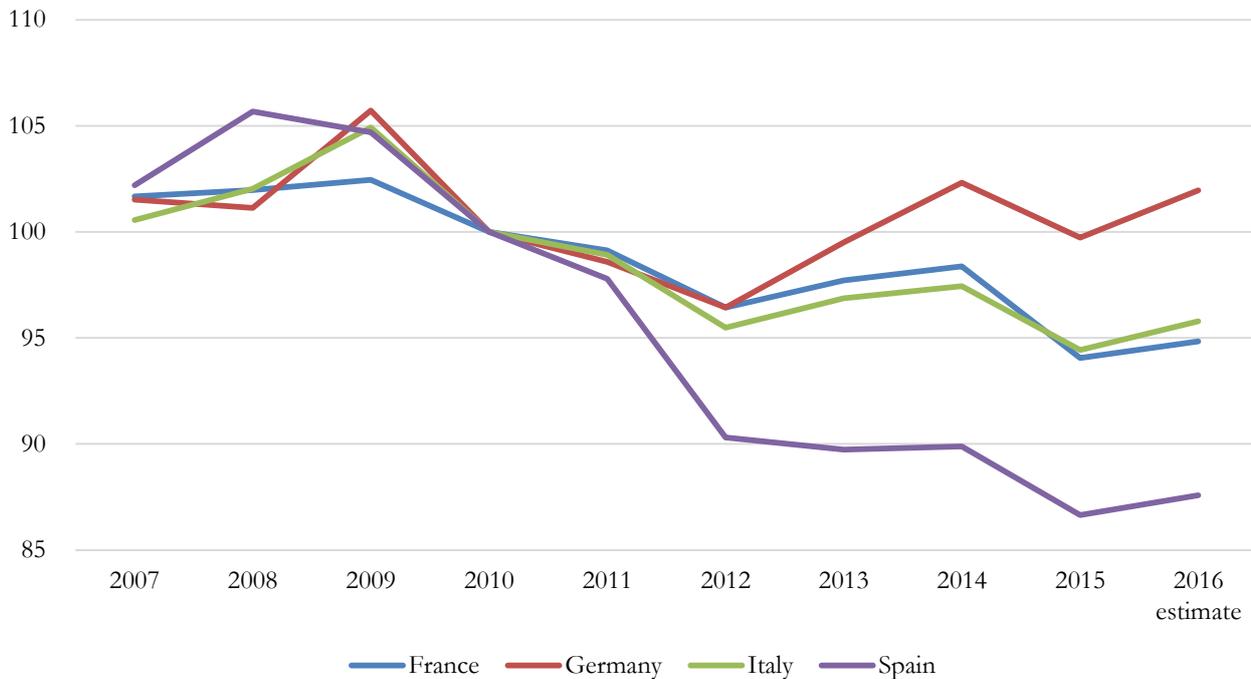
Figure B.5: Real effective exchange rates, producer prices (2010 = 100).



Source: Bank of Italy

Considering REERs based on unit labour costs, differences among the major Eurozone countries are larger, with France and Italy faring in the middle between the strong competitiveness gain of Spanish firms and the more stable behaviour of Germany's REER.

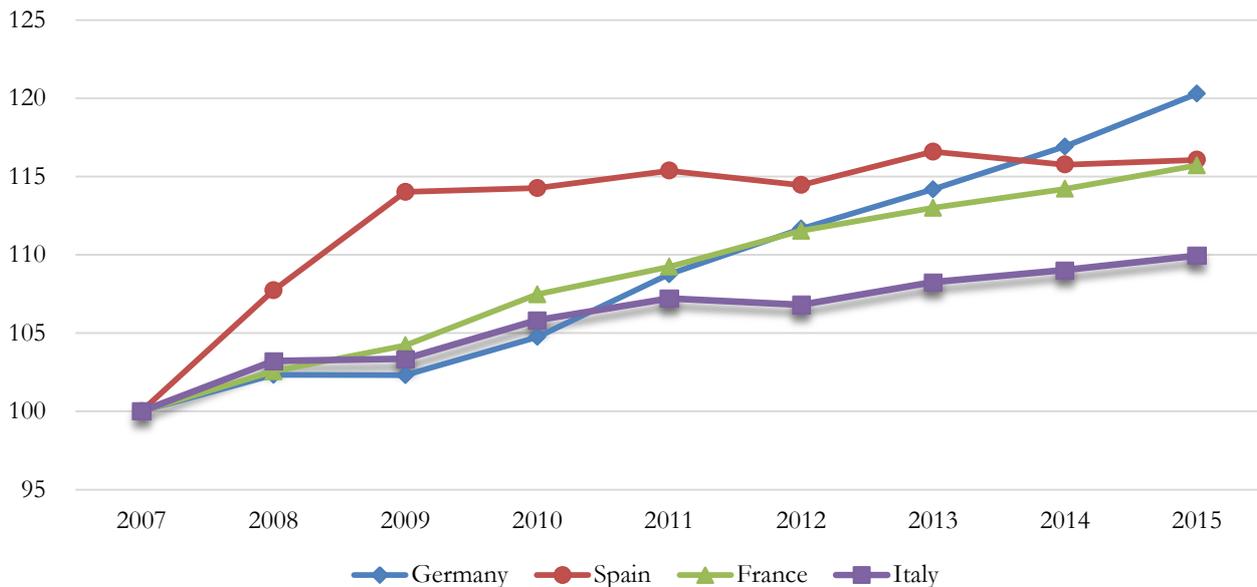
Figure B.6: Real effective exchange rates, relative unit labour costs (2010=100).



Source: OECD Economic Outlook

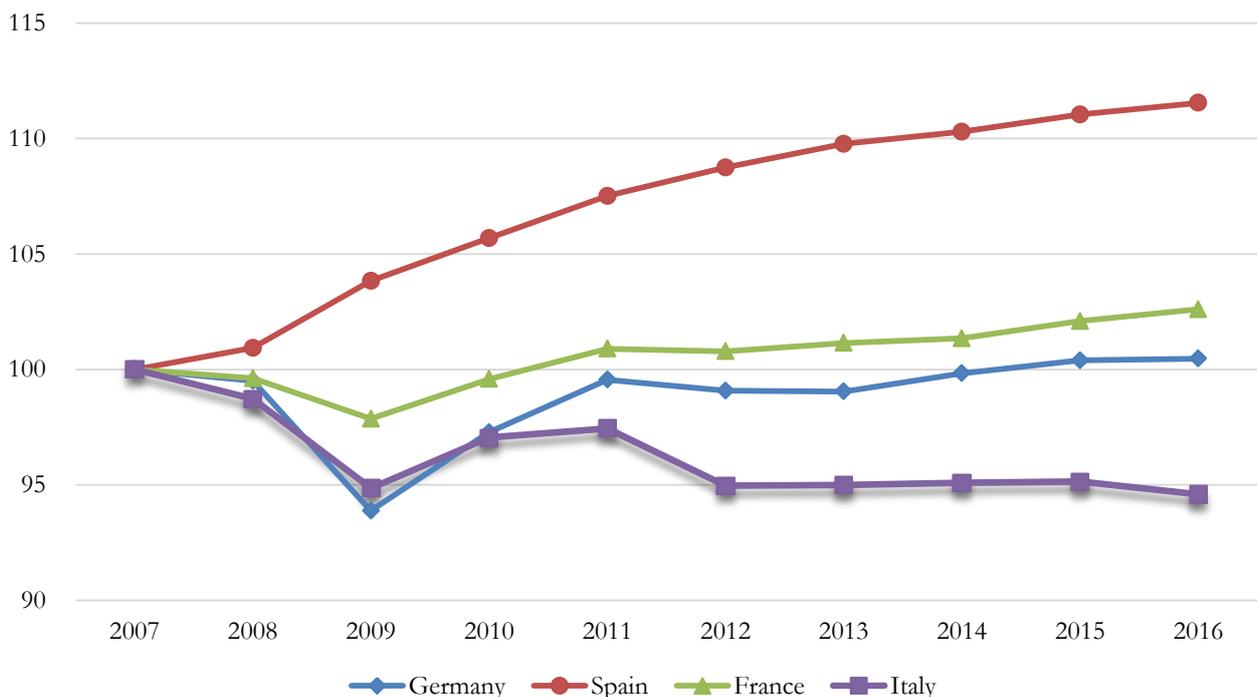
Leaving aside exchange rate fluctuations, the competitiveness of Italian firms in the Eurozone is affected by the relative growth of unit labour costs, which in turn reflects changes in wages and labour productivity. During the crisis, wage dynamics has been slower in Italy than in all the other major Eurozone countries. On the other hand, labour productivity has been particularly laggard, one of the most important structural problems of the Italian economy, and has often been traced back to an inadequate growth of total factor productivity. Longstanding problems of the knowledge creation and circulation system help understand why Italy ranks behind most European countries in the majority of indicators related to human capital, R&D, and innovation.

Figure B.7: Average annual wages (2007=100).



Source: elaborations on OECD data.

Figure B.8: Labour productivity in the total economy (2007=100).



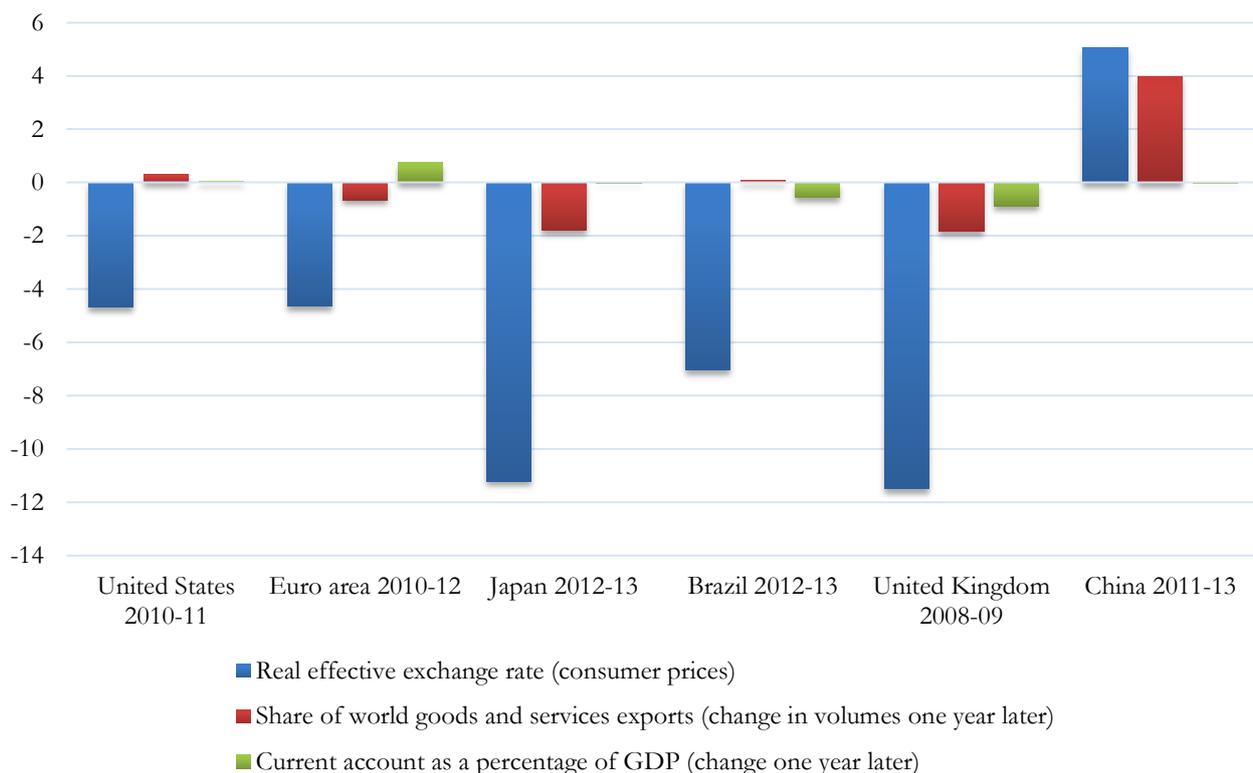
Source: OECD Economic Outlook

In conclusion, it can be argued that this gap in labour productivity, although negatively affecting several aspects of the Italian socio-economic system, has not translated into a significant loss of price competitiveness with respect to the other major Eurozone countries, because it has been offset by wage moderation, as well as by the prudent pricing strategies adopted by Italian firms. If this is the case, market share losses of Italian exports with respect to the Eurozone average should not be traced back to problems of price competitiveness.

On the other hand, the Euro depreciation during the crisis has not been enough to prevent a further market share loss of Italian exports with respect to the rest of the world. More generally, currency depreciations appear to be less effective than in the past in improving export market shares and the current account. This is partly the result of the recent development of more fragmented international production networks, increasing the importance of imported intermediate goods and services in production costs.

The following figure refers to some recent episodes of strong fluctuations in real exchange rates and shows the ensuing changes in the share of world exports in volume terms and in the current account balance as a percentage of GDP; variables that are expected to improve (worsen) after a currency depreciation (appreciation). Both these variables have been lagged by one year, to control for a possible reaction delay, as predicted by the J-curve model. Yet, the size of their changes is generally very small and their sign is often the opposite than expected, suggesting that the effect of price competitiveness on external transactions might be overwhelmed by the influence of other variables.

Figure B.9: Real exchange rates and external imbalances.



Source: IMF and OECD.

Structural factors and export performance

The analysis of a country's overall trade performance is too often conducted exclusively in macroeconomic terms, relating the dynamics of export and import volumes to the behaviour of other aggregate variables, such as real exchange rates and foreign or domestic income.

In many cases, however, these aggregate models prove to be inadequate in grasping the logic behind the phenomena observed. This occurs not only because, generally speaking, these models overlook important but difficult to quantify factors which help to determine foreign trade performance, such as product quality, or shifts in consumer tastes, as well as changes in international trade rules. A further reason for the inadequacy of these models is that even the influence of those variables which they most often do include, such as relative prices and income, cannot be fully captured in exclusively aggregate terms.

It is therefore necessary to consider explicitly the role of structural factors, which are understood as being the whole set of characteristics defining the distribution of foreign trade by product or by country. For example, given the growth of world demand and all other factors being equal, the dynamics of a country's exports may be more or less sustained, according to the degree of conformity between the international specialisation pattern of the country and the changes in the commodity structure of world demand. In other words, if the latter turns prevalently to products in which the country in question enjoys comparative advantages, the income elasticity of its exports shall be higher.

A frequently employed statistical method for evaluating the influence of structural factors on export growth and on the behaviour of a country's international market share is known as constant-market-shares (or CMS) analysis. This method is based on a decomposition formula, aimed at controlling changes in aggregate export market shares for the role of structural factors that depend on the correlation between a country's geographic and/or sector specialisation pattern and changes in the structure of the foreign demand.

Many different specifications have been proposed in the literature. Here we refer to the formula used in the Italian Trade Agency annual report, which is based on Memedovic and Iapadre (2010). This specification allows to identify the following effects:

- *Competitiveness effect* (CE), that is the weighted average of the changes of an exporting country's market shares in all the product/country segments in which the import market is subdivided. The underlying idea is that such changes display the effects of variations in relative prices and in the other competitiveness factors such as quality, image, distribution network, and so on, that make one country's products preferred to those of the competitors. Essentially, this effect is not ex-ante measure of the competitive strength of a country's products, but a synthetic ex-post indicator of their competitive performance in the destination market.
- *Commodity structure effect* (CSE), which measures how changes in the product composition of the destination market import demand affect an exporting country's aggregate market share. Its sign depends on the correlation between changes in the relative importance of each product in total imports of the destination market, and the market shares held by the exporting country in each product in the starting period. In other words, the more the country's export specialisation pattern (defined by the vector of its product shares in the starting period) is oriented toward the products with fast growing foreign demand, the more the CSE becomes favourable.
- *Geographic structure effect* (GSE), which shows to what degree the behaviour of a country's aggregate market share is influenced by changes in the distribution of the destination market demand by importing country. The better the geographic orientation of a country's exports corresponds to these changes, the higher its GSE. In other words, countries whose export market shares are relatively larger in the most dynamic importing countries will reach a positive and high GSE.
- *Structural interaction effect* (SIE), which depends on how changes in the geographic and commodity structure of destination market imports are related to each other. It is positive if

such changes tend to raise the relative incidence of the market segments in which a country is specialised.

- *Adaptation effect* (AE), that is a measure of the export specialisation pattern’s flexibility in response to changes in the structure of demand. From a different perspective, it can be seen as a “second measure of competitiveness” (Richardson, 1971), because it shows how much a country succeeds in concentrating positive trade performances (the rise in its market shares) in the most dynamic segments of the destination market’s imports.

This decomposition formula has been applied to changes in Italian exports market share of world imports from the Eurozone in the last fifteen years. Two different phases can easily be identified in the data. Until 2010, Italy’s market share underwent a sharp reduction, which however resulted only to a limited extent from a poor competitive performance on world markets. The most important factor was the negative commodity structure effect, which reflected the ‘dynamic inefficiency’ of the Italian economy’s international specialisation pattern, whose comparative advantages were concentrated in slow-demand traditional consumer goods. The opposite happened in the last five years, when the world demand for these products increased more rapidly than the average, reflecting the rise of middle class incomes in emerging countries. As a result, a favourable commodity structure effect fuelled a slight recovery of Italy’s aggregate market share⁸, notwithstanding a stationary competitive performance and a negative adaptation effect. In both periods, Italy’s market share was sustained by a positive geographic structure effect, revealing that, in comparison with the Eurozone average, the market distribution of its exports was relatively more oriented towards the most dynamic countries.

Table B.2: Italian exports share of world imports from the Euro area: constant-market-share analysis.

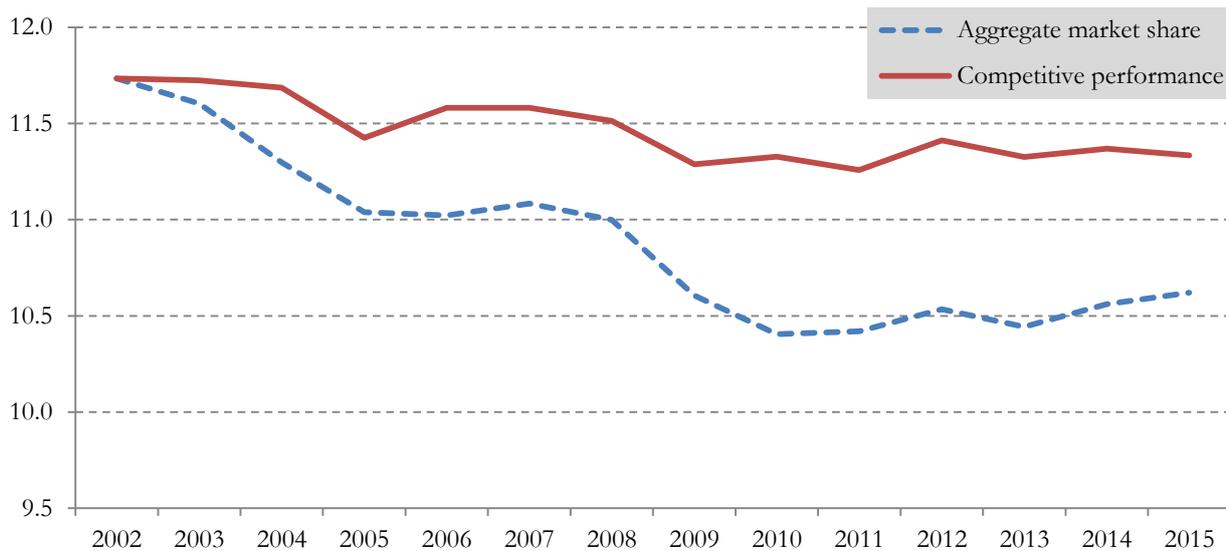
	2002	2010	2015
Market share	11.73	10.40	10.62
change		-1.33	0.22
Competitiveness effect		-0.41	0.01
Structure effect		-0.86	0.48
commodity		-0.76	0.26
geographic		0.20	0.13
interaction		-0.29	0.09
Adaptation effect		-0.07	-0.27

Source: Italian Trade Agency annual report.

Because the competitiveness effect measures a country’s competitive performance net of composition effects, it can be used to determine what could have been its aggregate export market share, in the abstract assumption that the world import distribution by commodity and destination market had remained unchanged, year after year. This is done simply by adding CE cumulatively to the aggregate market share in the starting year (2002). The following graph compares the ‘adjusted’ competitive performance of Italian exports computed in this way with the time path of their aggregate market share.

⁸ This result is in contrast with what presented in the previous pages, where Italy’s share of Euro area exports of goods shows a slightly negative trend even after 2010. The discrepancy can be due to the different data sources, as well as to the diverse statistical criteria used to define merchandise exports in customs data and goods exports in national accounts.

Figure B.10: Italian exports share of world imports from the euro area: constant-market-shares analysis.



Source: Italian Trade Agency annual report

The ‘adjusted’ competitive performance of Italian exports has been relatively better than what appears from their aggregate share of Eurozone exports. Until 2010, the gap can mostly be explained by the adverse effect of specialisation (SE), whereas in the last five years this effect has given a positive contribution, reducing the distance between the two curves.

The same statistical technique has been applied to the other major Eurozone countries⁹. France underwent a sharp market share reduction in the last decade (from 13.7 to 12.7 of Eurozone exports), as a result of a very strong negative competitiveness effect, only partly offset by a positive commodity structure effect. The rise in Germany’s market share in the same period (from 31.6 to 32.4 per cent) was entirely due to favourable structure effects, whereas the competitiveness effect was null. On the contrary, in the case of Spain the market share increase (from 6.1 to 6.3) was due essentially to a positive competitiveness effect, as the negative contribution of the structure effects was offset by a positive adaptation effect.

In order to explain export performance, it is increasingly important to understand its linkages with FDI and other forms of international production. On one hand, outward FDI and exports can be complements or substitutes, depending on the type and motivations of investing abroad. On the other hand, the ability to attract inward FDI can exert important direct and indirect effects sustaining export performance.

Exports and outward foreign direct investment (FDI)

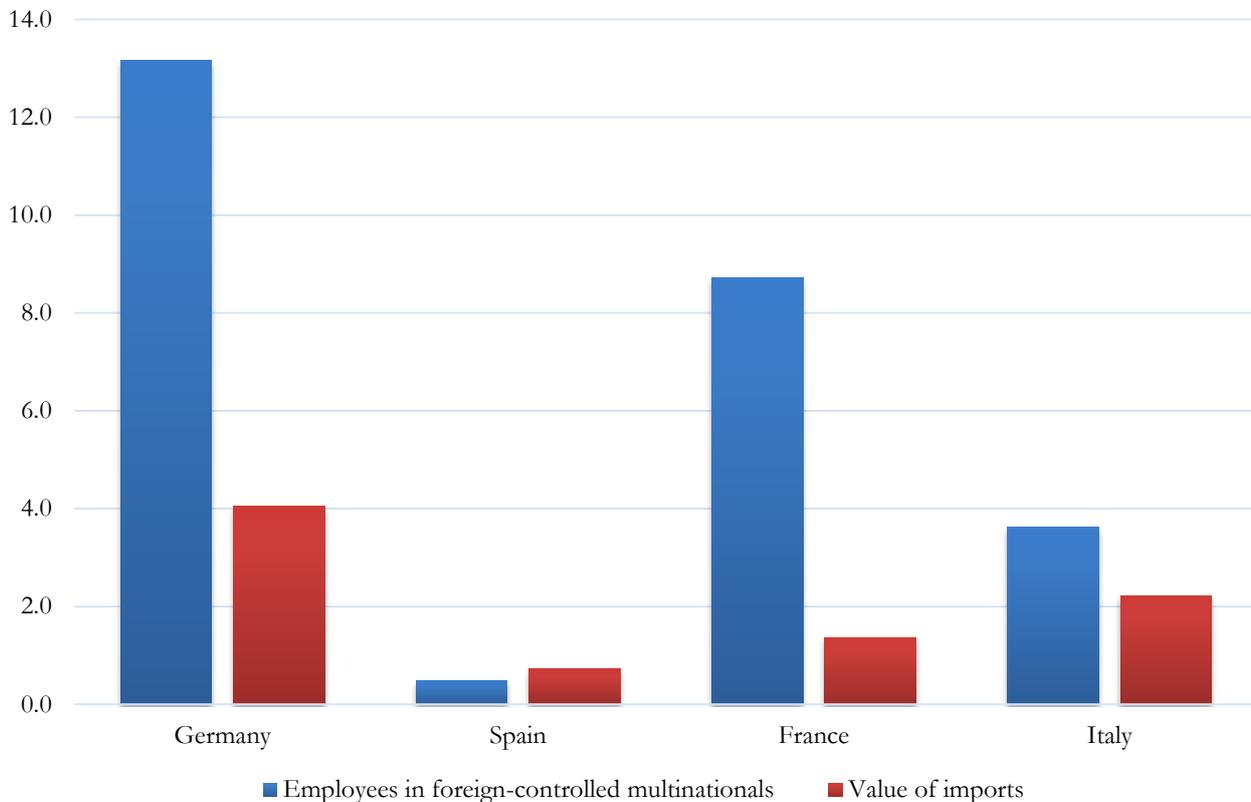
International market strategies of Italian firms are different than in most of the other major European countries. Due also to their relatively smaller average size, Italian firms face more problems in establishing a direct productive presence in foreign markets.

Taking the example of the US manufacturing market, the following figure shows very clearly the gap of the Italian (and Spanish) internationalisation pattern. The other large European industries tend to serve their US customers mostly through local affiliates, which allow overcoming trade costs, improving market access and reinforcing their competitive position. This is shown by the fact that their share of foreign-controlled affiliates in the US market (in terms of employees) is much larger than their export

⁹ See Italian Trade Agency (2016 - pp. 102-106).

market share. On the contrary, in the case of Italy, the productive presence is only marginally larger than the export market share.

Figure B.11: Trade and productive presence in the US manufacturing market, 2013.



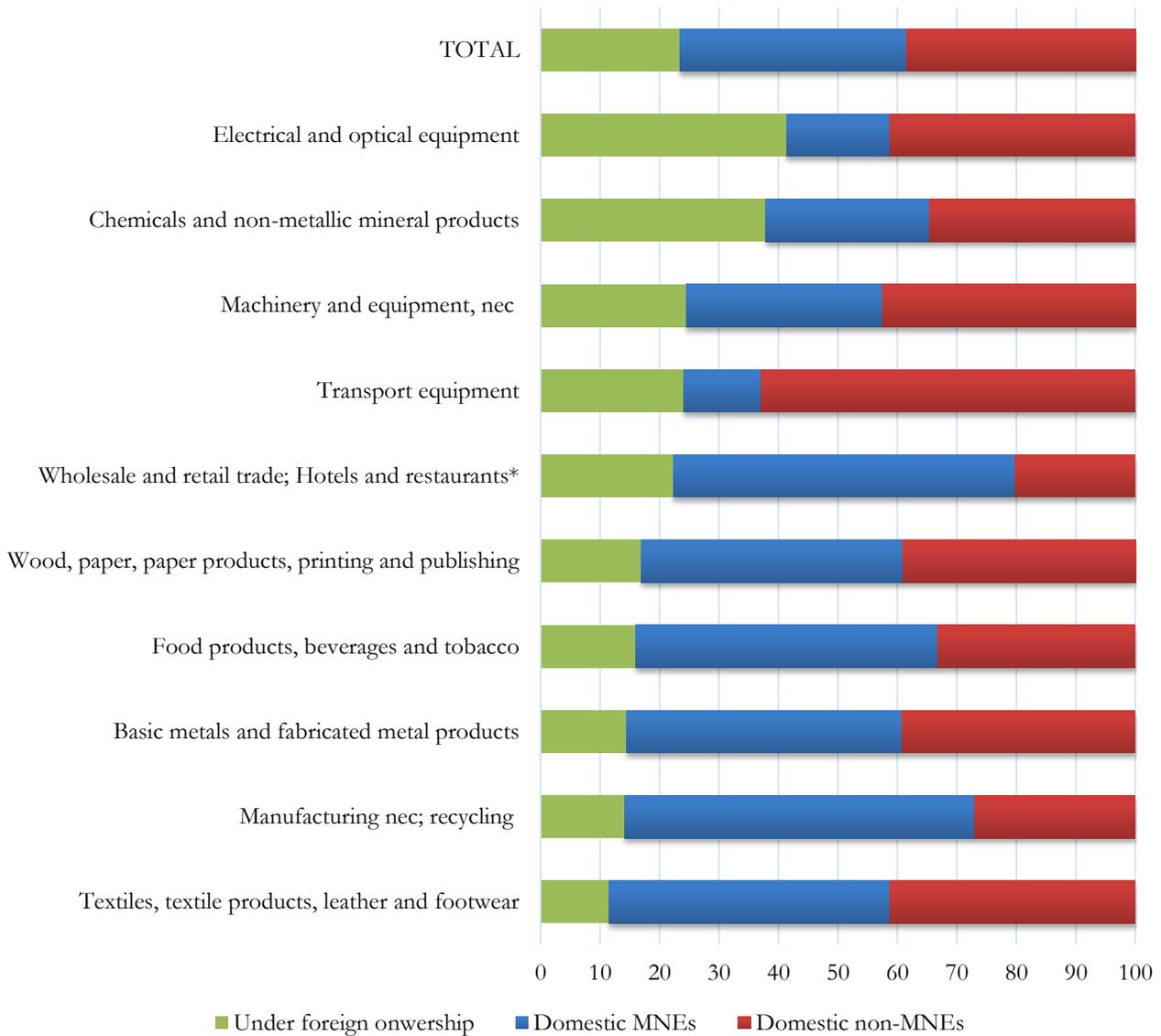
Source: Italian Trade Agency based on OECD and UN-COMTRADE data.

Yet, in the 90's, this gap was even stronger: the Italian share of foreign affiliates in the US market was negligible and much lower than the commercial presence. So, it can be argued that in the last decades Italian firms have gradually learnt to serve foreign markets through a direct productive presence. To a certain extent, this learning process has occurred at the expense of exports. This substitution has taken place in delay with respect to other developed exporters, which can help explain the fall in the market share of Italian exports.

Inward FDI and export growth

The limited ability of the Italian economic system to attract FDI has already been underlined at the beginning of this section. This is an additional factor that can explain the relatively poor performance of Italian exports. Foreign-controlled firms, even in Italy, are responsible for a significant share of national exports, particularly in *science-based* sectors. Moreover, affiliates of foreign multinationals can exert important positive effects on the export propensity of domestic firms. Thus, more successful FDI attraction policies could help sustain Italian exports.

Figure B.12: Italian exports across sectors by firm ownership, 2013.



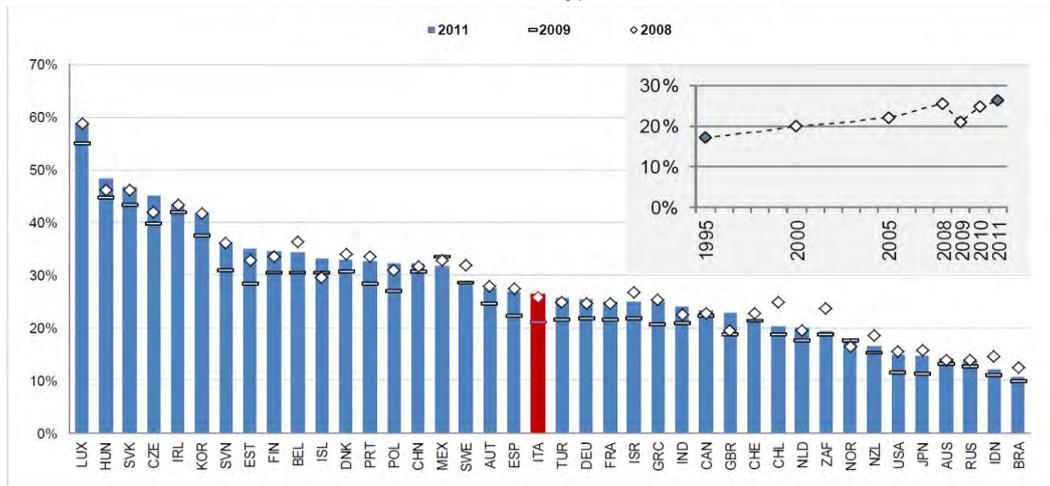
Source: ISTAT

Participation in international production networks (trade in value-added)

International production networks (IPNs) are not limited to intra-firm linkages among the affiliates of multinational corporations, but encompass inter-firm relationships connecting different multinational and local enterprises, performing different business functions in the same production process.

According to the OECD-WTO Trade-in-Value-Added (TiVA) indicators, the Italian economy’s participation in IPNs is comparable to the other major Eurozone countries. The following figure shows that the foreign value-added content of Italian exports, which is related to *downward* participation in IPNs, is similar to that of France, Germany and Spain, and has been recovering rapidly since 2009.

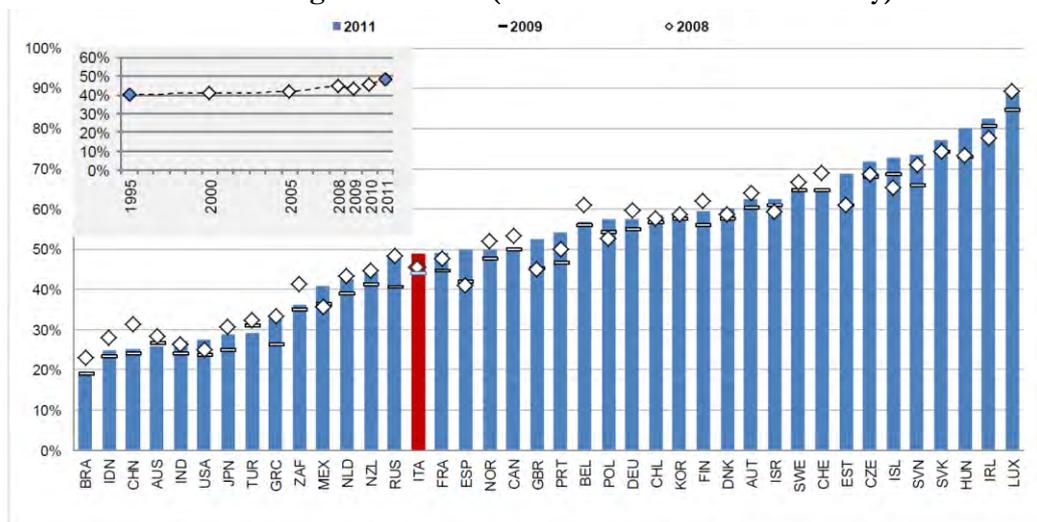
Figure B.13: Foreign value added content of gross exports by country, percent (right insert= time series for Italy)



Source: OECD, TiVA database

On the other hand, the following figure shows a measure of *upward* participation in IPNs, namely the domestic value added embedded in foreign final demand. In this case, Germany ranks remarkably higher than the other major Eurozone partners, revealing the stronger ability of its firms to coordinate producer-driven supply chains.

Figure B.14: Manufacturing domestic value added in foreign final demand by country. Percent of total manufacturing value added (left insert= time series for Italy).



Source: OECD, TiVA database

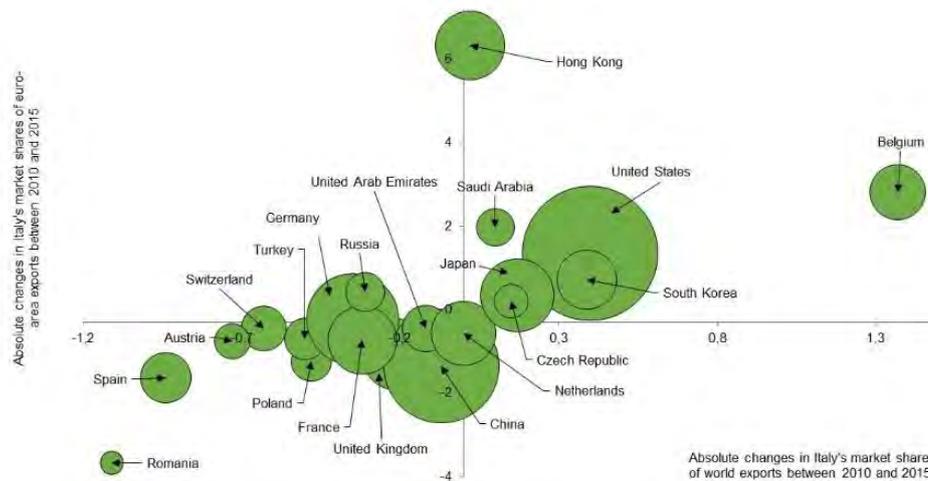
The available micro literature confirms that Italian firms tend to participate in intermediate stages of IPNs, whose value added tends to be lower than in the upward and downward stages, making their position more vulnerable. However, firm heterogeneity plays an important role in explaining the different performance of firms along the value chains (see Section 8 for an econometric investigation).

Export market shares by country

The Italian export performance in the 2010-15 period has been quite diversified across the main markets. The following figure relates changes in Italy's shares of world exports in each market with the corresponding changes in Italy's shares of Euro area exports.

Some important cases of clear competitive success emerge from the figure, e.g. the US, Japan, South Korea. There are also markets, such as Germany and Russia, in which Italian exports were unable to prevent a market share loss with respect to world exports, but outperformed the Euro area average. Yet, in all the other markets shown in the figure, Italian export performance was negative under both perspectives.

Figure B.15: Italy's shares of world and euro-area exports by market between 2010 and 2015.

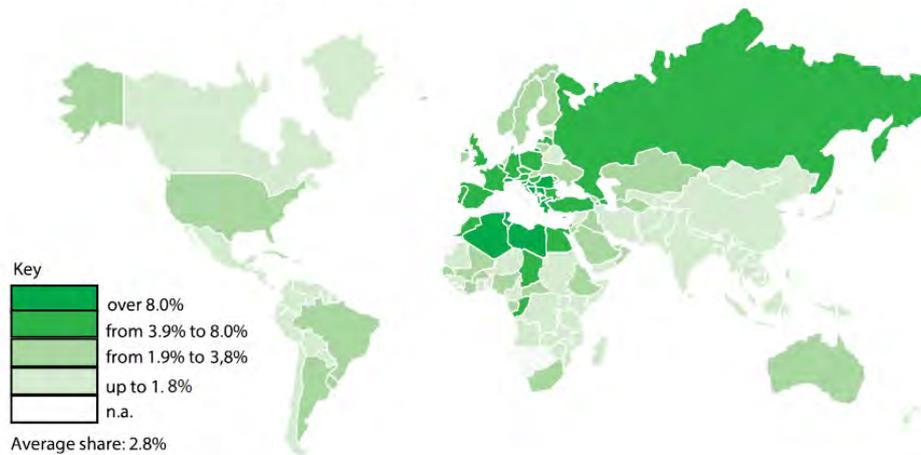


The circles are sized in proportion to market size in 2015, calculated as the country's share on world imports.

Source: calculations on IMF-DOTS, Eurostat and other national statistical institutes data.

The geographic distribution of Italian exports' market shares is affected by several factors, including distance, preferential trade agreements and historical factors. One important and often neglected influence stems from social networks related to migration flows. As shown by the following map, in countries such as Argentina, Australia and Brazil, where the Italian origin community is still relatively important, export market shares are higher than what expected based on bilateral distance and trade policies. On the other hand, Italy's export shares are relatively high in countries such as Albania and Romania, from which originate large communities of immigrants in Italy.

Figure B.16: Italian exports' market share by country in 2015.



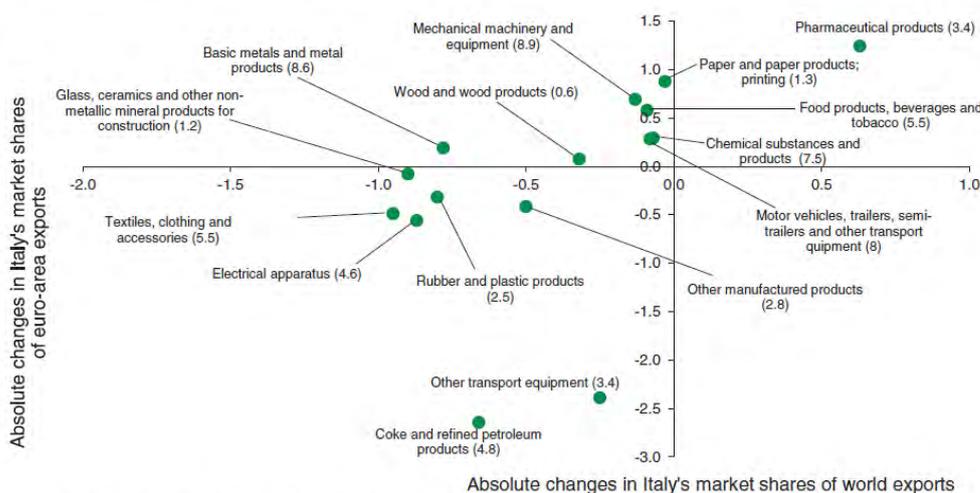
Source: Italian Trade Agency calculations on IMF-DOTS data.

Export market shares by sector

There is only one sector, namely the pharmaceutical industry, in which Italian exports have increased their market shares both with respect to world exports and with respect to the Euro area in the 2010-15 period. In addition, in a significant group of sectors, including food products, the mechanical industry, motor vehicles and several intermediate goods sectors, Italian exports, although growing more slowly than the world average, have increased their share of Euro area exports. In the remaining industries, including most of the typical *made in Italy* sectors, Italy's export performance has been negative on both dimensions.

Figure B.17: Italy market shares of world and euro-area exports by principal market and sector.

Absolute changes in percentage shares at current prices, 2010-2015



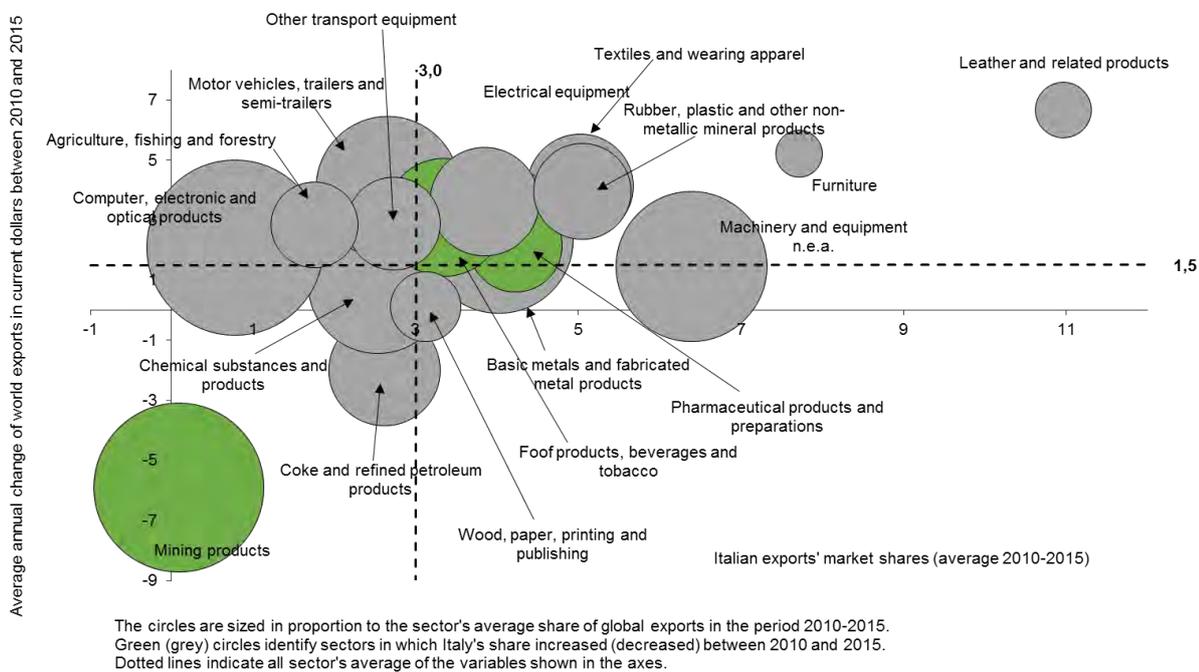
The value near the label indicates the sector's average share of world demand in the period 2010-2015.

Source: Italian Trade Agency elaborations on EUROSTAT data.

The following chart confirms what has already emerged from CMS analysis. In the 2010-15 period, sectors in which Italian exports enjoyed comparative advantages (as revealed by higher-than-average market shares) recorded a relatively higher growth of world demand. The positive correlation between

Italy's sector market shares and the dynamics of world demand is the most important determinant of the relatively better performance of Italian exports in the last few years.

Figure B.18: Italian exports' market shares and world demand's dynamics by sector.

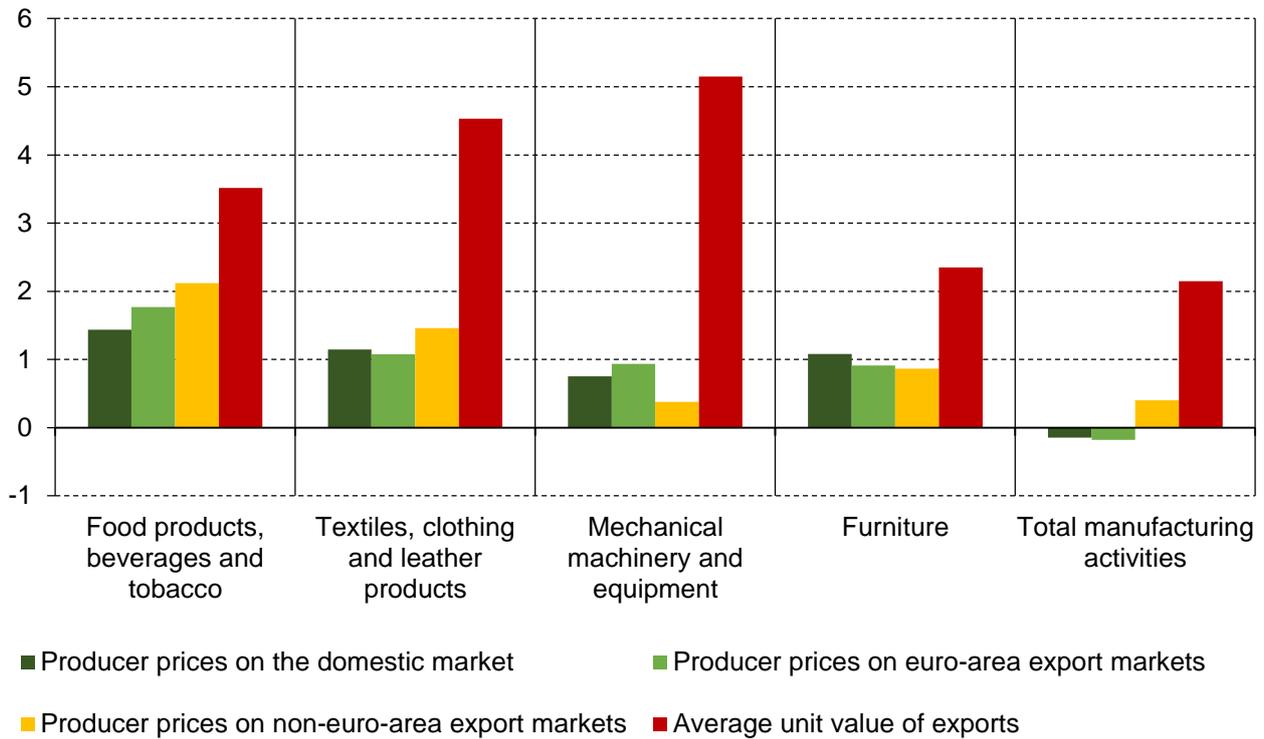


Source: Italian Trade Agency elaborations on ISTAT data

The following figure conveys some information about the market strategies of Italian exporting firms in the 2011-15 period, which was characterised overall by a slight depreciation of the euro, although with marked fluctuations within the period. Considering the total of manufacturing activities, it is clear that Italian firms adopted normal price discriminating strategies, using margins created by the euro depreciation to increase export prices outside the Euro area more than domestic prices. However, at the sector level, there are also industries in which the opposite behaviour seems to prevail, revealing very prudent pricing strategies in the most dynamic export markets.

In all the sectors shown in the figure, average unit values of exports rose much more rapidly than export prices. A similar pattern emerged already in the previous decade, and can be seen as a possible sign of upgrading in the relative quality of Italian exports. This could be also the result of the competitive selection process enacted by international integration and intensified by the global recession, which has put out of the market the least productive firms, operating in low-quality segments of each industry. A further explanation might be found in the outsourcing strategies of the most dynamic Italian firms, which could have shifted abroad the least qualified segments of their productive activities.

Figure B.19: Producer prices and average unit values of Italian exports for selected sectors. Average annual growth rates, 2011-2015.



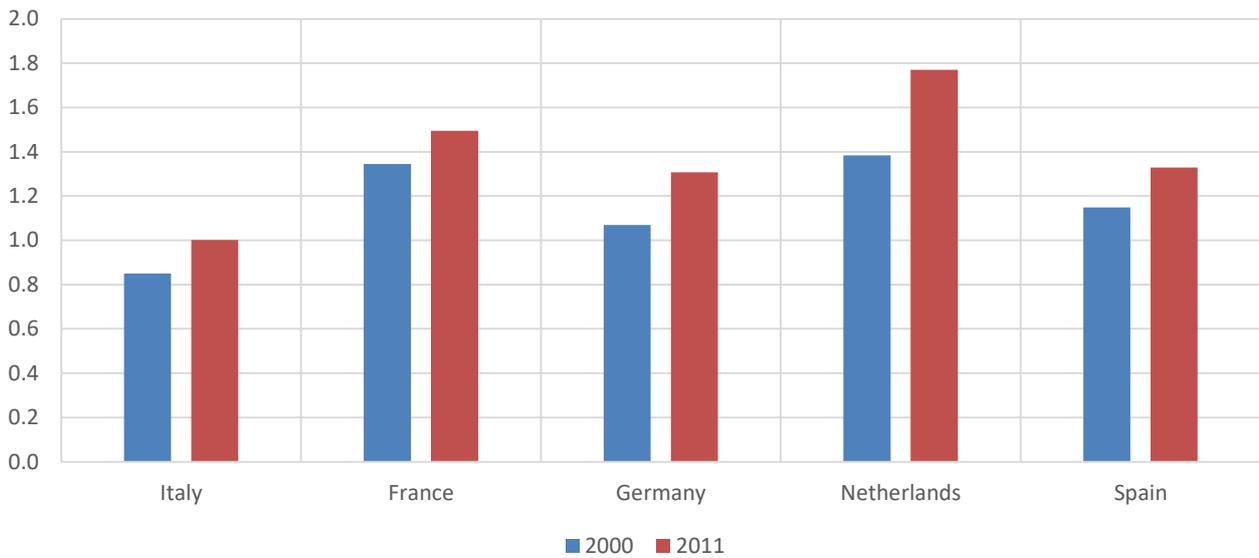
Source: elaborations on ISTAT data.

Innovation in the Italian economy

The available data on the processes of knowledge creation and diffusion in the Italian economy show a huge gap with respect to other developed countries, which is commonly considered to be one of the main explanations of its slower growth. The problem is already evident in data on the education system, which is the primary focus of public and private investment in the accumulation of knowledge. International comparisons in this regard are notoriously desolating. Referring to the age group between 25 and 34, the share of Italian population with a university degree was 10.5 per cent in 2000, against an OECD average of 26.4 per cent. Over the following decade, this share rose considerably, reaching 22.3 per cent in 2012, but anyway less than the OECD average, which rose to almost 40 per cent.

Annual expenditure in tertiary education per student, measured in dollars at purchasing power parity exchange rates, was less than \$ 10,000 in Italy in 2011, against an OECD average of \$ 14,000. Considering spending on university education in relation to GDP, Italy is at the last place among the main Eurozone countries. As shown in Figure B.20, the gap, which was already very high in 2000, has further expanded in the following decade.

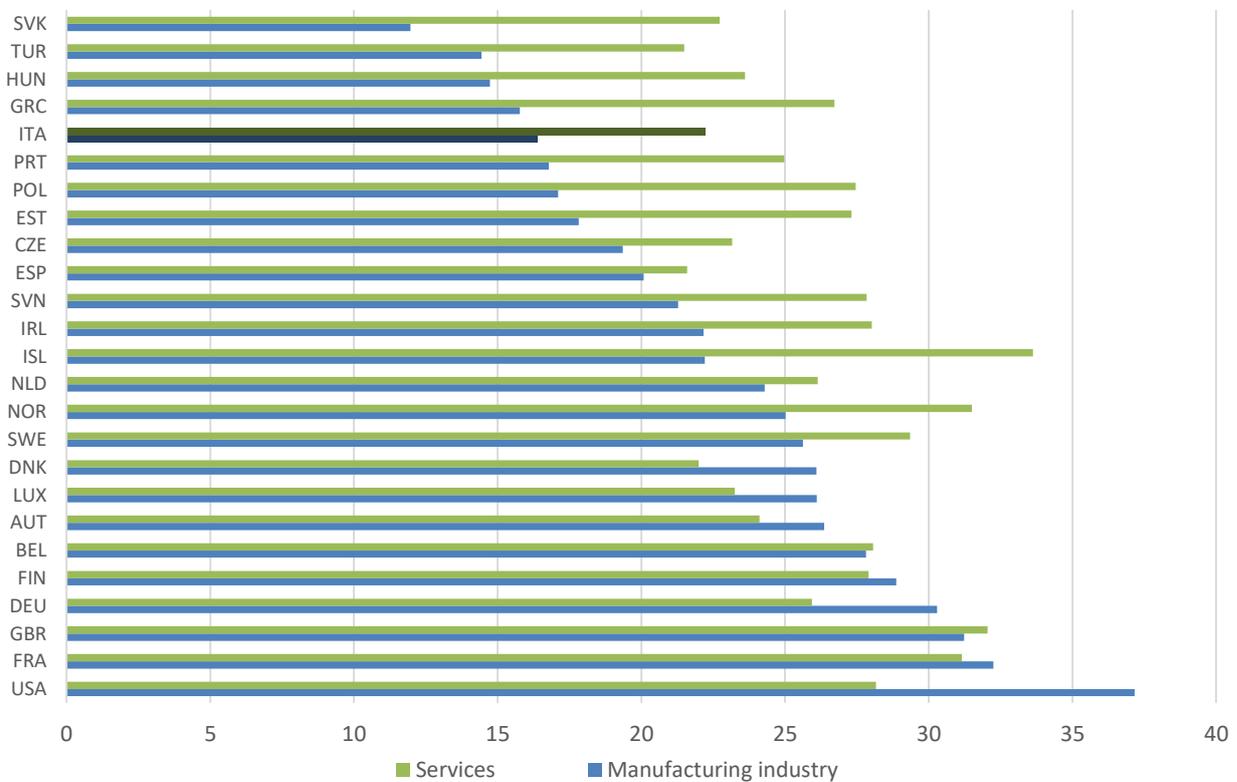
Figure B.20: Spending on higher education (as a percentage of GDP)



Source: OECD

The relatively low supply of skilled labour corresponds to a modest demand by firms in a vicious relationship of interdependence. Figure B.21 shows that in Italy the skilled-labour share of total employment was in 2012 well below most OECD countries, both in industry and in services.

Figure B.21: Skilled-labour share of total employment by sector – 2012 (percentage)*

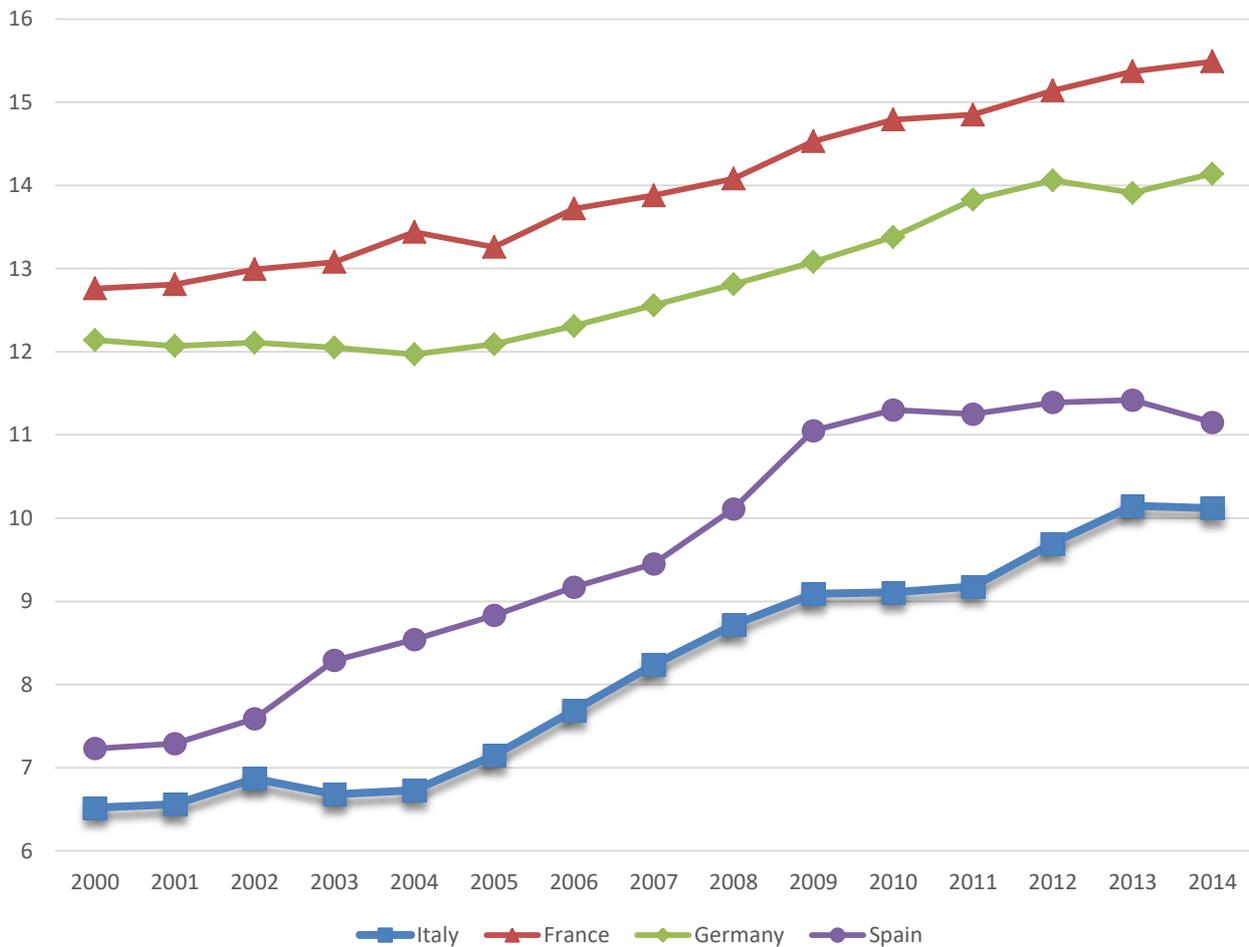


* Skilled labour is defined as occupations that relate to knowledge-based capital (KBC) according to the International Standard Classification of Occupations.

Source: elaborations on OECD data.

Similar conclusions are reached by focusing on the number of R&D personnel who, despite having increased faster than average employment growth over the last decade, remains at a modest level in comparison with the other main Eurozone countries (Figure B.22). The gap is concentrated in the business sector, while universities and public administration occupy a similar share of researchers than other countries. The link between the characteristics of the productive structure of the Italian economy and its poor ability to absorb researchers is therefore confirmed.

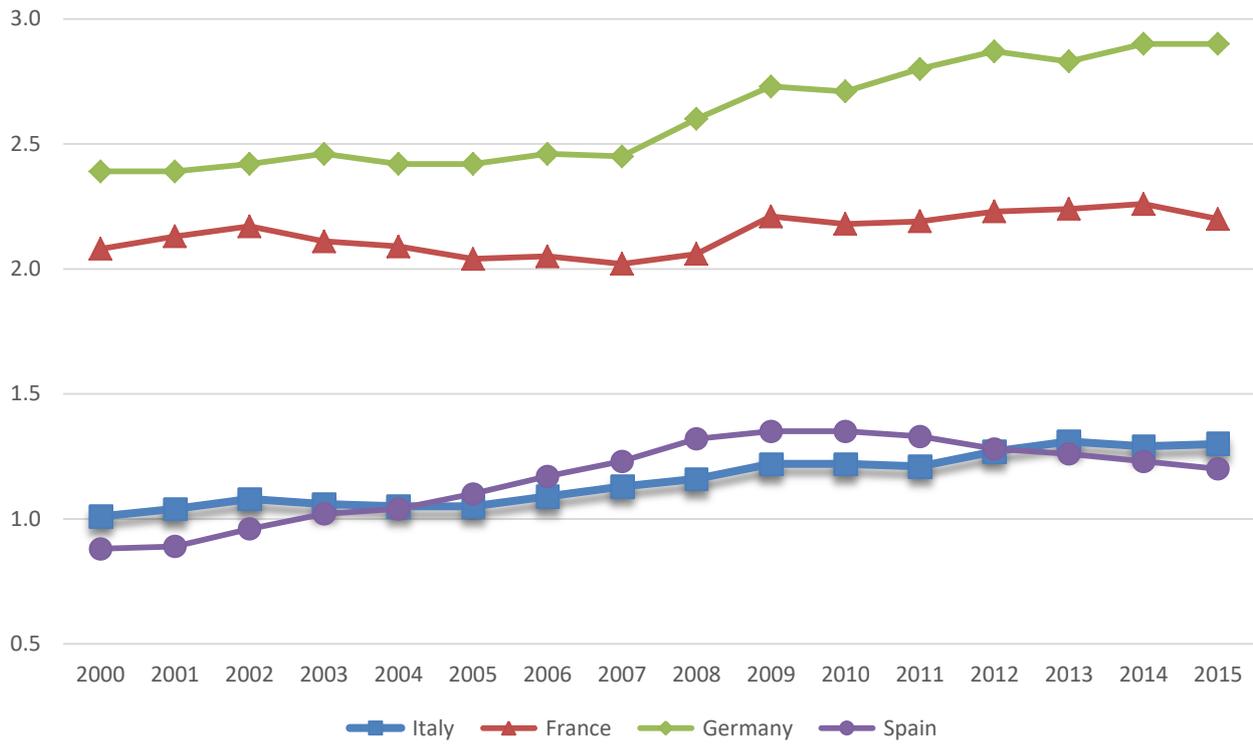
Figure B.22: R&D personnel per thousand total employment



Source: OECD

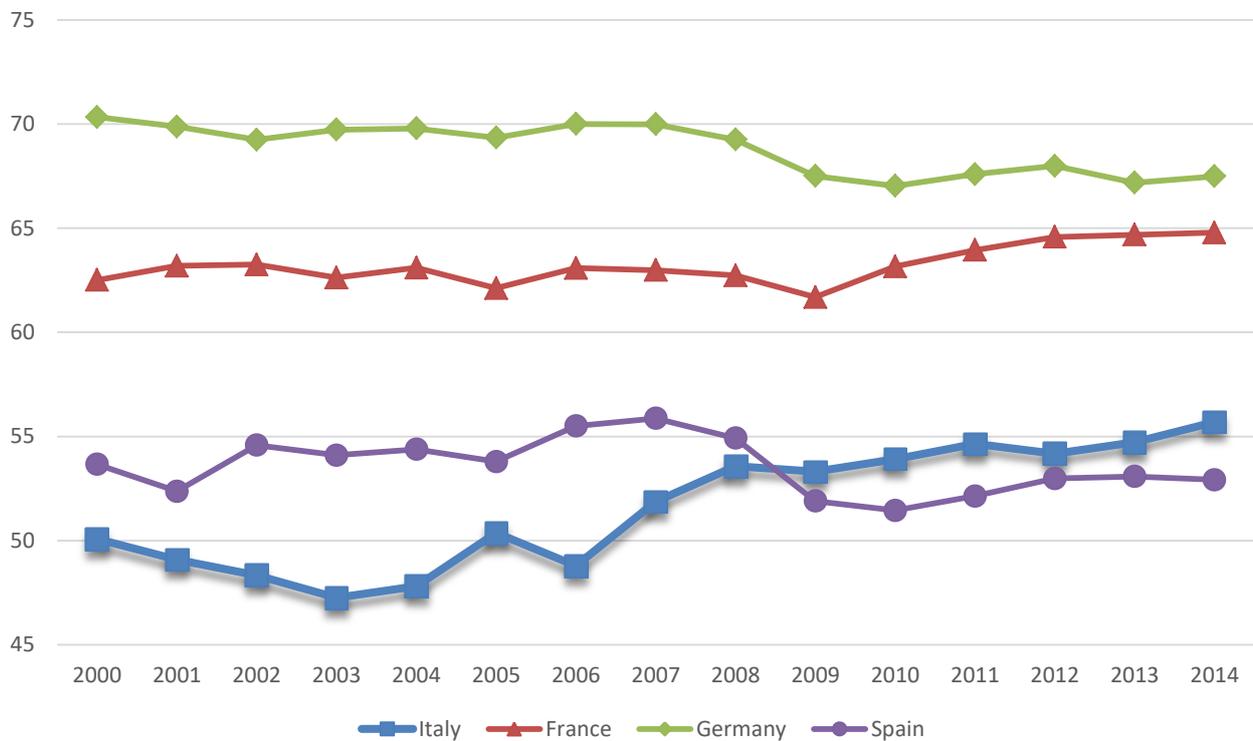
In addition to employees, one of the main inputs of innovation processes is R&D spending. Again, Italy is clearly below the main Eurozone countries (Figure B.23). However, over the last fifteen years, this indicator has gradually risen in Italy, driven by an increasing R&D investment by firms (Figure B.24).

Figure B.23: Gross domestic expenditure in R&D as a percentage of GDP



Source: OECD

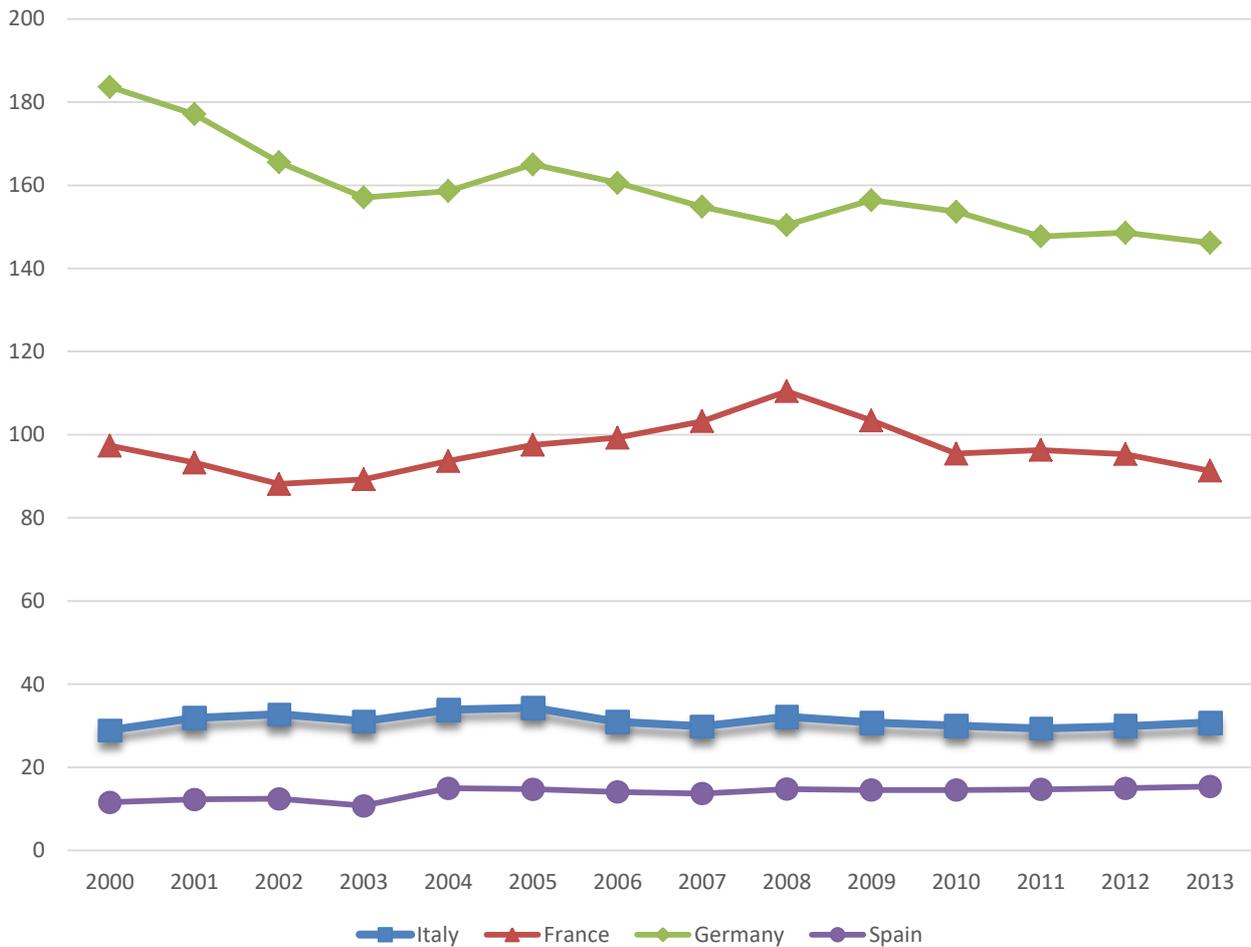
Figure B.24: Business share of Gross expenditure in R&D (percentage)



Source: OECD

The Italian production system ranks well below the OECD average also for the innovative output indicators more directly linked to R & D activities, such as patents (Figure B.25).

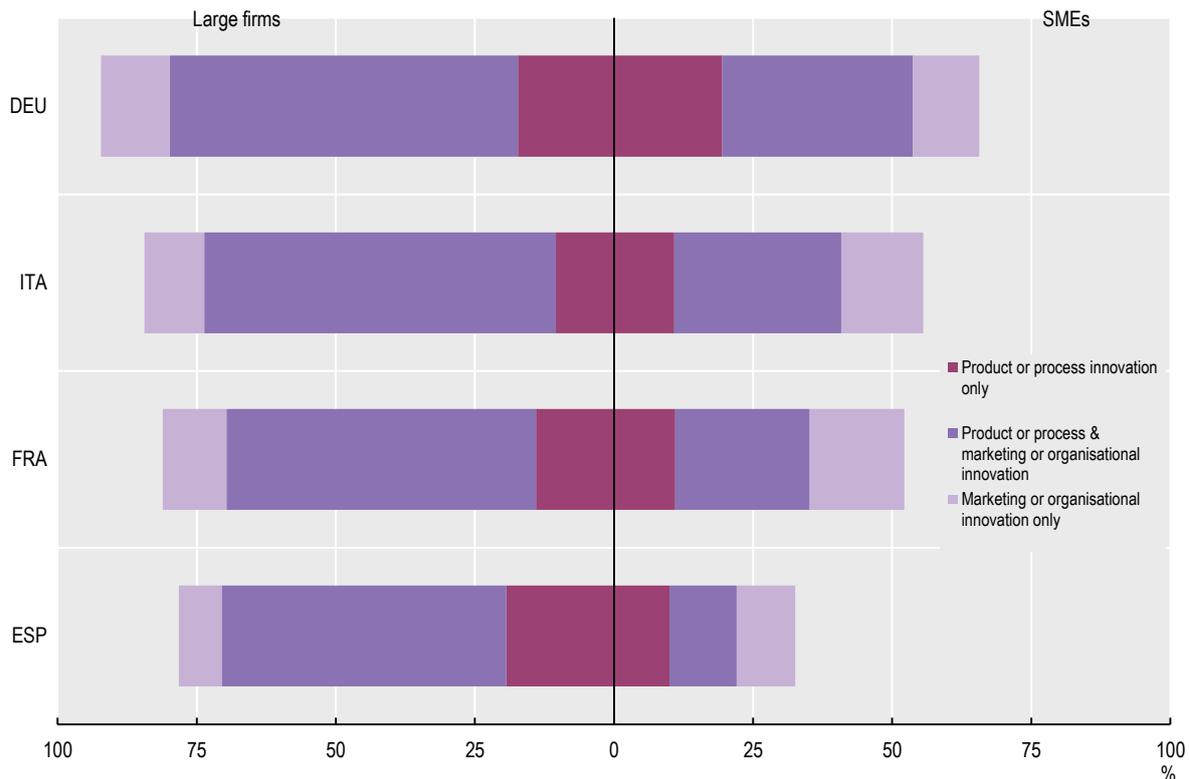
Figure B.25: Triadic patent families per GDP (OECD average = 100)



Source: OECD

However, in rankings on the share of companies claiming to make innovation (product, process, or marketing and organisation), Italy is in a better position than one could think of based on input indicators, (Figure B.26). This is another characteristic feature of the Italian industrial system, namely its willingness to introduce incremental innovations, adapting processes or products to customer needs, which do not necessarily require significant R&D investment, and are therefore more easily implemented by SMEs.

Figure B.26: Innovation types by firm size - 2010-12



Source: OECD

Recent changes in the trade specialisation pattern of the Italian industry

The previous analysis, based on the CMS technique, has shown that it is not possible to correctly interpret changes of export market shares without considering the structural features of their specialisation model. The debate on this topic has been going on for several decades and tends to converge on some fundamental characters, which have changed very slowly over time and define a pattern, which is somewhat different than those of the main advanced countries and exhibits a high degree of polarisation (the average intensity of the advantages and disadvantages compared).

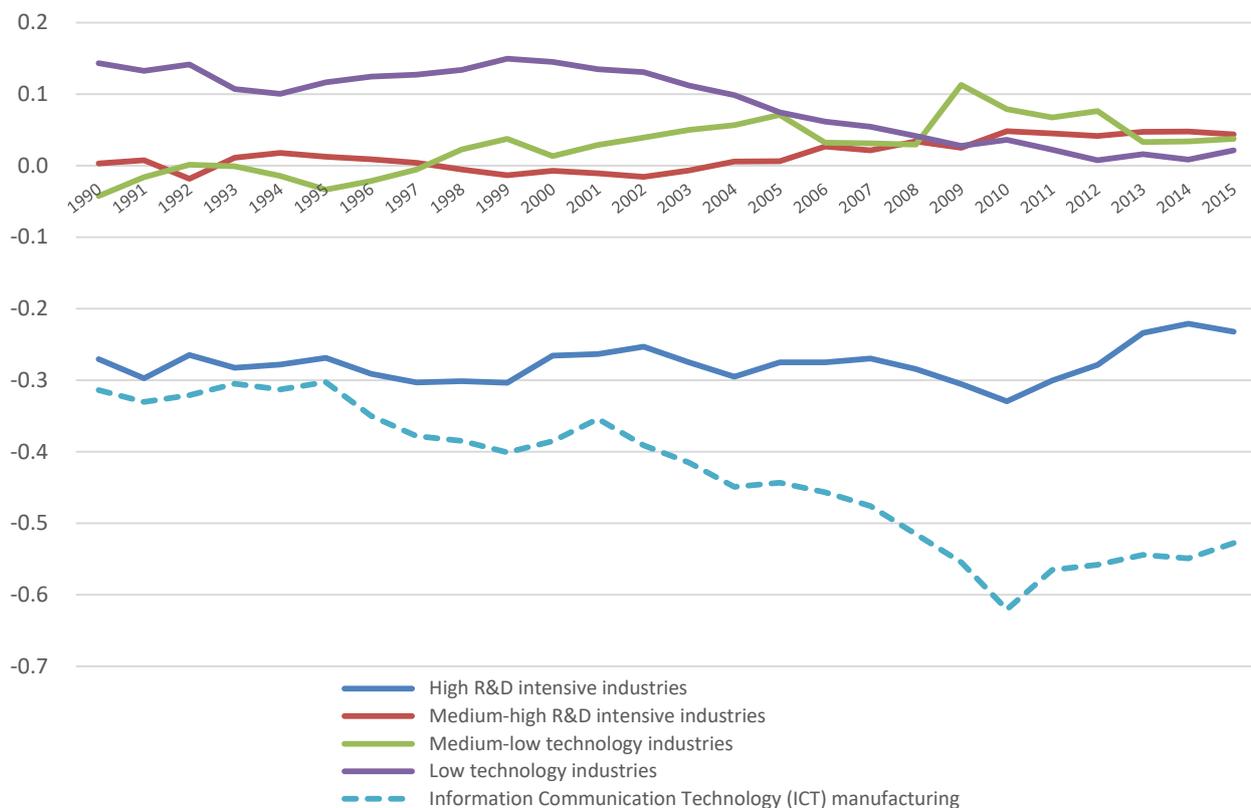
Several criteria have been used to assess the quality of the Italian model. The results of the CMS analysis until 2010 reveal a problem of "dynamic inefficiency", due to its concentration on products with a relatively low income-elasticity of demand. In the 1980s, this argument was used to explain the existence of an "external constraint" that prevented the Italian economy from growing rapidly without encountering external debt sustainability problems. The process of European monetary integration, culminating in the adoption of the euro, has diluted this constraint, but the underlying features of the specialisation pattern have continued to curb export growth, at least until 2010, as it has been shown.

Moreover, it has often been argued that the Italian specialisation pattern is concentrated in products characterized by a relatively high price-elasticity of demand, which would make it more vulnerable to competitive pressures from low-wage countries and trade liberalisation policies.

Other frequently used criteria refer to the supply characteristics of traded products. Studies based on the well-known Pavitt's taxonomy, identify the comparative advantages of the Italian industry in "traditional" and "specialized suppliers" industries, while weaknesses emerge in science-based and scale-intensive sectors. Here we refer to the technological intensity of traded products, as defined by the OECD taxonomy.

Figure B.27 shows the net trade specialisation (NTS) indices for the four classes of technological intensity defined by the OECD, and for the subset of ICT manufacturing industries¹⁰. The first important information that comes out of it is that, since the beginning of the 2000s, the comparative advantages of the Italian industry in traditional low-tech industries, which characterised its specialisation pattern since the 1970s, progressively weakened, and became negligible in the last years of the great recession. In their place, specialisation has been strengthening in medium-technology products, including industrial machinery. However, weakness in R&D-intensive productions, and especially in ICT, has remained strong, even if in the last five years these comparative disadvantages have tended to downsize. Overall, there is also a fall in the degree of polarisation of the model, which has always been relatively higher than that of the major European countries.

Figure B.27: Net trade specialisation indices of the Italian manufacturing industry



Source: OECD

¹⁰ The net trade specialisation index (NTS) is defined as follows:

$$NTS_{i,s} = \frac{\left(\frac{X_{i,s} - M_{i,s}}{X_{i,q} + M_{i,q}} \right)}{\left(\frac{X_{i,s} + M_{i,s}}{X_{i,q} + M_{i,q}} \right)} ; \text{with: } -1 \leq NTS_{i,s} \leq 1$$

where X and M denote respectively exports and imports, i stands for the country, s for the sector and q for the sum of sectors.

This indicator, adapted from a measure of intra-industry trade specialisation proposed by Balassa and Bauwens (1988), has several advantages. First, unlike the well-known Balassa index of revealed comparative advantages (RCA), it is based on both exports and imports, giving a more comprehensive and theoretically well-founded measure of trade specialisation. Second, with respect to other net-trade indicators proposed in the literature (Lafay, 1992), it has a more straightforward interpretation as a measure of intensity of inter-industry specialisation as it does not depend on other variables, such as the size of the sector or its degree of openness (Iapadre, 2001).

When looking at the NACE sectoral composition of manufacturing exports, it emerges that the Italian trade specialization has been going through some relevant changes (Table B.3). During the last period, some non-traditional sectors, such as “Pharmaceuticals” and “Motor vehicles”, have significantly added on their relative weight over the total export composition. Furthermore, differently from what predicted by some scholars, many traditional “Made in Italy” sectors, “Foods and Beverages” and “Textiles and Apparels” among others, have increased their importance in terms of shares of total exports. These dynamics may be backed by an intra-sectoral restructuring following from a repositioning of a large number of Italian firms on market segments characterised by higher value-added levels.

Table B.3: Export distribution by manufacturing sector (%), two-year-periods averages

	1995-1996	2001-2002	2006-1007	2011-2012	2015-2016
CA Food products, beverages and tobacco products	5.3	5.5	5.6	6.9	7.6
CB Textiles, wearing apparel and leather products	17.2	15.9	12.5	11.6	12.3
CC Wood and paper products, and printing	2.2	2.4	2.1	2.1	2.1
CD Coke and refined petroleum products	1.3	1.8	3.7	5.1	2.9
CE Chemicals and chemical products	6.1	6.4	6.5	6.9	7.0
CF Basic pharmaceutical products and pharmaceutical preparations	2.1	3.6	3.6	4.4	5.5
CG Rubber and plastics products	7.7	7.4	6.8	6.2	6.3
CH Basic metals and fabricated metal products	8.9	8.5	12.3	13.5	11.0
CI Computer, electronic and optical products	5.4	5.4	4.0	3.5	3.3
CJ Electrical equipment	6.4	6.4	6.4	5.5	5.5
CK Machinery and equipment n.e.c.	18.8	17.6	19.2	18.9	18.5
CL Transport equipment	10.6	11.4	11.2	9.9	12.0
CM Furniture and other manufacturing	7.8	7.6	6.2	5.6	6.0

Source: elaborations on ISTAT data.

Exporting firms by firm size

The business structure of the Italian economy is notoriously characterised by a relatively high number of small and medium-size enterprises (SMEs). Many observers claim that this is one of the most important structural weaknesses of the Italian industry, because SMEs, particularly when they are family-owned and lack professional managers, tend to face serious growth constraints. Comparisons across firm size classes show that labour productivity, as well as the intensity of skilled labour and capital, tend to grow with firm size, which helps understand why smaller firms face serious problems in overcoming the costs and risks of investment in innovation and internationalisation.

Table B.4 compares the extensive and intensive margin of exports by firms size across the main countries of the Eurozone.

It is immediately clear that in Italy the share of micro-sized exporters is comparable to the ones detected in its European peer economies (France, Spain and Germany). Nevertheless, their contribution to the overall value of exports is significantly smaller. On the contrary, when focusing on the ‘10-49’ and ‘50-249’ size classes, the intensive margin of exports (i.e., the average value of exports per firm) of Italian companies is particularly high, revealing their prominent degree of external competitiveness. On top of that, whilst being relatively few in number, it is important to emphasise that Italian large firms exhibit a relevant intensive margin that ranks second, immediately after Germany.

Table B.4: Exporting firms and exports by firm size - 2014

Number of employées	France					Germany				
	Exporting firms		Exports		Exports per firm	Exporting firms		Exports		Exports per firm
	Number	%	Million euro	%	Thousand euro	Number	%	Million euro	%	Thousand euro
Up to 9	77.845	65,2	84.744	20,1	1.089	114.392	57,7	33.597	4,3	378
10-49	28.555	23,9	41.606	9,9	1.457	56.593	28,7	59.974	6,8	1.208
50-249	9.597	8,0	62.477	14,8	6.510	21.094	10,5	127.610	13,9	6.719
At least 250	3.311	2,8	233.015	55,2	70.376	6.436	3,0	752.172	74,9	124.778
Not specified	2.115	-	16.215	-	7.667	116.311	-	151.681	-	1.305
Total	121.423	100,0	438.057	100,0	3.608	314.826	100,0	1.125.034	100,0	3.506

Number of employées	Italy					Spain				
	Exporting firms		Exports		Exports per firm	Exporting firms		Exports		Exports per firm
	Number	%	Million euro	%	Thousand euro	Number	%	Million euro	%	Thousand euro
Up to 9	127.409	66,1	23.629	6,2	185	107.955	72,4	26.128	11,7	242
10-49	53.217	27,6	69.050	18,2	1.298	30.790	20,6	33.285	14,9	1.081
50-249	10.200	5,3	113.812	30,1	11.158	8.177	5,5	52.380	23,5	6.406
At least 250	1.864	1,0	172.063	45,5	92.308	2.247	1,5	110.978	49,8	49.390
Not specified	27.148	-	20.319	-	748	44.493	-	20.889	-	469
Total	219.838	100,0	398.873	100,0	1.814	193.662	100,0	243.660	100,0	1.258

Note: percentage shares refer to the total of classified firms.

Source: elaborations on Eurostat data.

The above evidence further underlines the need to conduct micro level analyses, in order to better understand how firm heterogeneity affects the external competitiveness of the Italian economy. The analysis described in section 4 is aimed at filling this gap, by presenting a detailed analysis of the available evidence at the enterprise level. To this extent, in the next section we summarise the main findings of the microeconomic literature on external competitiveness setting up a framework for the study at the centre of this document.

3 LITERATURE REVIEW

3.1 INTRODUCTION

This section of the report aims at providing a thorough review of the analyses on the patterns and determinants of competitiveness, with a special attention to firm-level drivers, especially within the Italian case. As a starting point, we acknowledge the need of framing the notion of competitiveness as a multidimensional concept (see the Box. 1 below for a summary of the contributions exploring such multidimensionality). First, competitiveness has different meanings depending on whether it is considered at the micro, meso, and macro levels. Even if the main focus is on micro-level analyses, we need to account for the interdependency of firm-level competitiveness with sectoral and national characteristics and priorities. Second, one needs to distinguish between the contextual enablers of competitiveness, *i.e.* quality of institutions, business environment, and infrastructures; the structural conditions underlying competitiveness, that can be measured in terms of innovative capacities, technological conditions, and productivity; as well as the competitive performance, expressed in terms of exports, FDIs, market shares, and other indicators. Third, whichever the level of analysis – and particularly in the case of firm-level analyses – competitiveness issues are largely shaped by the way global value chains (GVCs) are organised and governed. All these facets of competitiveness are addressed reviewing theoretical, empirical, and policy oriented contributions.

With specific reference to Italy, on the one hand we review an extensive empirical literature investigating this country's (long lasting) weak productivity dynamics (see, for example, Codogno, 2009); on the other hand, we provide an overview of contributions focusing on the heterogeneity of firms' performance in Italy, highlighting the existence of a cluster of Italian firms with high export propensity and increasing market shares (Tiffin, 2014). In addition, we take into account the importance of some specific features of the Italian firms such as corporate governance and ownership structure, family management, and managerial characteristics.

This section is organised as follows. First, we set the framework encompassing the different elements of competitiveness that are taken into account. After that, we deal with analysis and measurement of competitiveness looking at macro (3.3.), industrial, and micro-level approaches, with a particular emphasis on the latter. The subsequent section analyses the role of production fragmentation and GVCs in shaping competitiveness, while the next part reviews recent contributions investigating the dynamics of competitiveness in Italy. Finally, we provide some conclusions.

Box 1: Exploring the multidimensionality of competitiveness

The identification of the forces shaping trade dynamics has always been a key analytical task in economics. Since Ricardo (1815), theoretical and empirical efforts are put forth to identify the causes laying behind the international success of economies and the evolution in the allocation of market shares. Conceptually, however, competitiveness is largely seen as a broad concept encompassing different definitions. From a methodological perspective, there is no unanimous consensus on how to measure 'competitiveness' of countries, industries, and firms.

The need to foster countries competitiveness is at the top of the agenda for policy makers. As Krugman (1994) argued, however, "...only firms compete, not countries...". That is, export performance - as measured at the country or at the industry level - is always an aggregate of export activities of firms located in that territory. In this regard, competitiveness fundamentally relates to magnitude and drivers of firms' relative performance as well as to the intrinsic heterogeneity of the latter (Castellani and Koch, 2015). Therefore, understanding and measuring competitiveness requires tackling the issue of its multidimensionality.

Multidimensionality refers to the fact that meaning of competitiveness, as well as its measurement, is

affected by: the point of view adopted – *i.e.*, firm, sector, or country level – and whether it is measured in terms of enabling factors (innovation, human capital, cost reduction, productivity, quality of institution) or actual performance (exports, imports, FDIs, or market shares). Moreover, in order to explain competitiveness, one needs to account for a multitude of factors, often intertwined with one another: comparative advantages, firms’ characteristics and strategies, enabling factors such as institutions and infrastructures, underlying structural conditions as expressed in terms of factor endowments, skills, and technological capacity of competitors, and the positioning within GVCs.

The dynamics of competitiveness is closely related to the one of technological change. A relevant distinction regards the strategies of *cost* and *technological competitiveness* pointed out by Pianta (2001). Building on the ‘Schumpeterian’ differentiation between product and process innovation, two different strategies to pursue international success are identifiable. More precisely, Pianta (2001) relies on the concepts of technological and cost competitiveness summarising strategies focusing either on i) products quality and complexity and on R&D; ii) or on efforts directed at labour-saving innovation, new machineries, efficiency gains and cost reductions. A recent stream of empirical literature – see, among the others, Lucchese and Pianta, 2012; Bogliacino and Pianta, 2013 – takes advantage of such a distinction to shed light on the (significantly) heterogeneous economic impact of each of those strategies. This heterogeneity is, on the one hand, intrinsic to the strategies *per se*; on the other, it is magnified by the different institutional and technological characteristics of countries and industries where competitiveness is measured. On similar grounds, Dosi et al. (1990, 2015) emphasise the role of technological change and innovation in spurring competitiveness. Dosi et al. (2015) argue that trade flows are primarily driven by sector-specific absolute advantages rather than inter-sectoral comparative advantages – as it is according to the Ricardian-trade theory and to the developments that followed. The authors state that heterogeneities in firms’ and sectors’ trade performance stem from widespread technological asymmetries among countries. Such asymmetries reflect the different capability of some countries in producing innovative commodities (*i.e.*, commodities which other countries are not yet capable of producing, irrespectively of relative costs) and using process innovations more efficiently or more quickly, thus reducing input coefficients.

As argued above, firms are the main actor of countries’ and industries’ competitiveness (Krugman, 1994). Hence, to understand competitive performance one needs to tackle the heterogeneity concerning key characteristics of the firms such as size, productivity, innovation, organisational differences, and internationalisation strategies (Castellani and Koch, 2015). From this point of view, the abstraction of the ‘invariant representative firm’ hampers the understanding of competitive performance since it does not account for firms’ *ex ante* heterogeneity and strategic responses. From this perspective, Meyer and Ottaviano (2007) identify a set of elements helping to capture firms’ heterogeneity and implications in terms of international performance.¹¹

The first element concerns firms’ *size*. International markets are expected to be *loci* where real competition takes place: harsher than domestic ones; and largely played on innovation, products quality, and strategic positioning within global production networks. It can be recalled, in fact, that firm-level competitiveness points to the companies’ ability in designing, producing, and marketing products that are superior to those offered by competitors, whereby superiority regards price, quality, technological advancement, and several other factors. In this respect, size matters because larger firms may have greater opportunities to exploit internal resources to develop innovations – both product and process - and to adapt to the rapid pace of international competition.

Firm *age* is another element potentially affecting competitiveness. However, such an element is more controversial as compared to the former (for a review of the empirical contributions on the relation with international performance, see Grazzi and Moschella, 2016). According to Grazzi and Moschella

¹¹ The consideration of this set of elements potentially contributing to firms’ international performance should be subordinated to the idea that: i) such elements are fundamentally interrelated among them ii) the impact each element can have on competitiveness varies substantially according to a firm’s technological characteristics as well as institutions and enabling factors.

(2016) – investigating Italian firms export dynamics conditional on their age – and to Berthou and Vicard (2015) – using French custom data to analyse the relative importance of age and size– young firms are the best performers in international markets. This evidence relates to the idea that a large share of newly-born firms is highly innovative and display a ‘genetic’ higher propensity toward the international markets (‘born global’ firms). The rationale is that setting up a new firm exporting since its very inception may well signal both the existence of the skills and capabilities required to engage in international trade, as well as the willingness to look for growth opportunities not only domestically, but also abroad (Grazzi and Moschella, 2016). On the contrary, other authors as Roberts and Tybout (1997) and Arnold and Hussinger (2005) find the opposite result identifying a positive relationship between age and export performance. These authors relate such a positive linkage to the role of knowledge and experience accumulation. That is, older firm are expected to accumulate specific knowledge, capabilities, and experience which can prove to be crucial to address costs and barriers to entry in international markets.

A third element, put forth in Meyer and Ottaviano (2007), concerns the role of *product diversification* – often associated with size and R&D activities. In particular, the ability of selling more than one product positively affects the likelihood of increasing international market shares. Similar arguments hold for the number and variety of foreign destinations where firms sell their products. Accordingly, a greater international success may characterise firms selling their products in a relatively larger number of foreign destinations.

Fourth, the literature on the determinants of external competitiveness gives a prominent role to firms’ *productivity*, raising a number of theoretical and empirical issues. First of all, as in the case of product diversification, also productivity is related to firm size – big firms are supposed to accumulate internal knowledge and capabilities as well as engaging in R&D activities expected to spur productivity. Moreover, from a theoretical standpoint, productivity can be interpreted in different ways – tracing back to the role of labour cost reduction, process innovations aimed at making the productive process more efficient (Pianta, 2001), or organisational innovations for gaining market shares. Causal links are also controversial. On the one hand, the positive association may reflect self-selection mechanisms whereby companies that are ex ante more productive have a higher likelihood of exporting (Bernard 1998) and investing abroad (Criscuolo et al 2005). On the other, the degree of internationalisation may itself affect productivity through learning by exporting (Wagner 2007) and learning by investing (Castellani 2001, Castellani and Zanfei 2006), implying a reversed direction of causality. Empirically, the available empirical evidence displays a deeply controversial picture concerning the relationship between firm productivity and international performance (on this point, see also Bottazzi et al., 2010; Dosi et al., 2012, 2015).

Finally, a large literature emphasises the importance of the ‘*degree of internationalisation*’ as an indirect driver of greater and persistent ability in accumulating foreign market shares. The idea that the degree of internationalisation matters has roots in both international business and international trade literature. Hymer (1960) has first posited a “superior technology” characterising more internationalised firms –especially multinationals- and explaining their differential performance relative to less internationalised companies. This view has been subsumed in international trade models, highlighting that a higher international involvement is likely to be associated with higher productivity premia that are necessary to overcome the extra-costs of cross-border operations (Helpman, Melitz, and Yeaple 2004). Ex post advantages are also associated with higher degrees of internationalisation. In their influential contribution, Johanson and Vahlne (1977) develop a model to study the ex post advantages associated to international involvement. The model allow to capture the importance of knowledge and experience acquisition on foreign markets. The latter is identified as a crucial ‘asset’ for firms to increase their involvement abroad. Addressing the importance of the ‘degree of internationalisation’, Dunning and Narula (1995) stress that existing ‘knowledge facilities’ such as R&D infrastructures are key to successfully penetrating in foreign markets, value chains, and learning opportunities. Meyer and Ottaviano (2007) suggest that a relatively more intense presence on international markets – both in terms of sales and of FDI – is a vehicle through which firms may accumulate capabilities and

information to defend and consolidate international positions, obtain cheaper or technologically advanced intermediate inputs, and take advantage of technological spill-overs.

In macroeconomic terms, competitiveness makes sense at the country level if the economy's structural dimensions are explicitly taken into account (Landesmann et al. 2015). In fact, countries relative competitiveness can be interpreted in terms of 'structural current account constraint'. The latter points to situations according to which economic growth is constrained by trade-balance deficits. From this point of view, persistent deficits in the current account (of which the trade balance is the most prominent component) would encounter an external financing constraint spurring the risk of foreign-debt driven crisis (O'Connell, 2015). Thus, policy actions aimed at fostering countries' competitiveness should reduce risks of a 'trade balance constrained' growth dynamics. This considerations point to the importance of economies sectoral composition in terms of industries' relative weight and productive capacity. In this regard, economies characterised by weak productive capacity in tradable sectors and marginalised within GVCs are relatively more prone to crisis driven by excessive current-account deficits. Relying on these elements, a number of studies – see, among the others, Fagerberg (1988), Carlin et al. (2001), Dosi et al. (2015) – focus on the 'meso' dimension putting at the centre of the stage the relative competitiveness of industries. In these studies, economies structural – relative weight and characteristics of industries – and macroeconomic features are jointly considered with industries' international performance.

Nevertheless, multidimensionality is a key issue when it comes to understanding, evaluating, and measuring competitiveness at the macro level. In this respect, Oughton (1997, p. 1488) argues that 'the disaggregated definition of competitiveness, which can be applied at firm, industry, and sector levels may not be consistent with the aggregate or national definition since it is possible that firm-level competitiveness is achieved through down-sizing (particularly labour-shedding)'. If competitiveness is achieved reducing labour inputs rather than increasing output for a given amount of input, than '...part of the benefits that accrue to the firm (or industry) level will be offset by reduction income associated to labour shedding...'. Oughton (1997)'s arguments shed light on the need of accounting, on one side, for feedbacks and loops among factors spurring competitiveness. On the other, they highlight the need of adopting a multidimensional perspective to conceptualise competitiveness at the macro-level and to translate the aim of improving competitiveness into sound policy prescriptions. Furthermore, it is relevant to underline how efforts provided to enable and foster competitiveness should take into account the general aim of raising employment levels and living standards (Oughton, 1997).

A major issue concerns the measurement of competitiveness. There is no consensus on how to properly measure competitiveness for countries and regions and over time. From a firm-level perspective, moreover, competitiveness can be measured looking at different dimensions: exports, export market shares, number of foreign destinations where firms sell their products. Such measurement issues can be analysed by focusing on four different points. The first one refers to the need of building country-level indicators of competitiveness which account for the heterogeneous contribution given by firms to countries', regions', and sectors' relative competitiveness. As Castellani and Koch (2015) largely stress, competitiveness measures based on aggregate data need to be complemented with additional indicators built-up from micro-data. The authors label these measures as 'bottom-up indicators'. The objective is to combine firm-level information on international performance to build indicators providing information on countries, regions, or sectors but taking simultaneously into account firms heterogeneity. Secondly, the measurement of competitiveness may be hampered by the lack of data. This element can affect measurement at all levels: country, region, sector, and firm. Nevertheless, lack of data – or the fact that data are characterised by a partial coverage with respect to the statistical units involved into the analysis – affects relatively more company-level rather than sectoral or country-level investigations. This is particularly true when it comes to international comparisons due to a scattered coverage of firm level information in some countries – this problem is emphasised when the aim is a comparison conducted both cross-country and over time (on this point, see Altomonte et al. 2011). Third, aggregate competitiveness measures –

in particular the Real Exchange Rate (REER) – are significantly affected by the way indicators are built. Giordano and Zollino (2015), show that price and non-price competitiveness indicators provide substantially divergent information concerning economies competitive performance –in particular, Unit Labour Cost (ULC) and Producer Price Index based indicators for the major Eurozone economies. This divergence is related to the increasing fragmentation of production and to the diffusion of offshoring practices. In particular, the divergence among indicators of macro competitiveness based on labour cost deflators -relying on domestic data- may neglect the role of imported intermediate inputs and their labour cost component (see Section 3.1). Besides, it emerges an overwhelming role of non-price competitiveness – say, the role of innovations in driving trade performances and market shares allocation – in explaining advanced economies international performances. In this respect, key factors affecting competitiveness at the macro level – immaterial capabilities, public and private services spurring quality, complexity and technological content of products - may be overlooked or mis-measured by traditional indicators which may then provide misleading pictures. From this point of view, Landesmann et al. (2015) systematically compare measures of competitiveness at the sectoral level by resorting on both export and trade in value added data. The latter allow to go beyond raw export information capturing value-added flows connected to countries participation in GVCs – that is, accounting for the role of intermediate inputs flows and re-exporting activities.

3.2 UNDERSTANDING AND MEASURING COMPETITIVENESS AT THE COUNTRY, INDUSTRIAL, AND FIRM LEVEL

Multidimensionality, affecting the understanding and the measurement of competitiveness, matters both conceptually – with respect to which element of economic performance competitiveness is analysed – and empirically – which technique and which indicator is adopted and how far the latter allows to capture such multidimensionality. In this section multidimensionality is addressed by reviewing contributions that analyse competitiveness at macro, industrial, and firm level. Regarding the macro level, a particular attention is posed on characteristics, strengths and weaknesses of the main competitiveness indicators – REER¹², ULC, PCI and PPI based indicators (subsection 3.1). With respect to the sectoral level, subsection 3.2 reviews contributions investigating the dynamics of competitiveness of industries and paying attention on economies’ structural dimension, as well as on the role of fragmentation and GVCs. Subsection 3.3 focuses on the firm-level dimension and reviews the main theoretical and measurement issues.

Castellani and Koch (2015) provide a mapping of existing competitiveness indicators describing complementary aspects. Their grouping refers to the following six areas: i) productivity ii) market shares iii) price and costs iv) innovation and technology v) firms dynamics vi) GVCs.

Altomonte et al. (2011), propose a definition of competitiveness referring to the firms’ ability (in a given country) to mobilise and efficiently employ (also outside the country’s borders) the productive resources required to offer those goods and services for which other goods and services can be obtained (domestically or internationally) at favourable rates of substitution (or terms of trade). Their definition stems from the recognition that performance of countries is critically affected by the performance of firms. A macro-oriented definition is proposed by Landesmann et al. (2015). The latter identifies countries’ competitiveness with their ability of follow a growth path which is not balance-of-payment constrained. In this sense, Landesmann et al. (2015) emphasise the role of structural composition and the relative importance of tradable sectors in the economy. Guarascio, Pianta, Bogliacino, and Lucchese (2015), Guarascio and Pianta (2016) and Guarascio, Pianta, and Bogliacino (2016) adopt a meso (industry-level) perspective to compare the relative weight of cost and

¹² The latter is a weighted geometric average of bilateral exchange rates of a country’s main trading partners deflated by a measure of relative inflation.

technological competitiveness strategies – proxied by change in labour cost, introduction of process innovation, and new products– as drivers of industries international success – measured in terms of export market shares. In their framework, the authors evaluate, simultaneously, the impact on industries’ trade of cost and technological competitiveness strategies; and of intermediate inputs flows distinguished according to their technological intensity.

Competitiveness at the macro level

In the aftermath of Great Recession that followed the 2008 financial crisis, the international academic and institutional debate renewed the interest in the assessment of competitiveness at the macro level (Landesmann et al. 2015; Giordano e Zollino, 2015). Trends of (macro) competitiveness indicators have shown a weak correlation with external performance of Euro-zone countries in the decade prior to the eruption of the global financial crisis (see Table 1 for a synthetic list of the main macro competitiveness indicators reporting advantages and drawbacks). Therefore, the reliability of such indicators as accurate measures of the relative international performance of a country, as well as of the sustainability of its international relationships (particularly when it comes to external debt issues), has been largely questioned. As Giordano and Zollino (2015) underline, the main limitations of existing indicators of relative costs and prices arise from the contradictory signals provided by different indicators applied to the same country and from the weak correlation that such indicators display with respect to countries’ external performance – particularly in the case of current account imbalances as stressed also by Landesmann et al.(2015).

Main macro competitiveness indicators and deflators

Indicator	Description	Advantages	Drawbacks
<i>Real effective exchange rate (REER)</i>	Weighted geometric average of nominal exchange rates of a country’s main trading partners, deflated by relative deflators	Provide a synthetic measure of countries relative competitiveness	Its meaning can vary considerably according to the adopted deflator
<i>Consumer price indices (CPIs)</i>	Deflator built including both final goods and services	Available for all advanced and a large set of emerging economies	Exclusive focus on final goods and subject to distortions owing to fiscal measures
<i>Producer price indices (PPIs)</i>	Deflator built including information on all categories of manufactured goods (consumer, intermediate and capital)	Focusing solely on tradeables omitting any information on services	Lack of homogeneity across countries and no information on services
<i>GDP based deflators</i>	Deflator based on GDP data and referring to all sectors and to all types of goods and services	Largely available and provided on quarterly basis	Not fully comparable across countries due to the controversial measurement of services’ activity; subject to composition effects between the public and private sectors
<i>Unit labour costs in manufacturing (ULCMs)</i>	Deflator based on data referring to ULC dynamics in manufacturing	Largely available and provided on quarterly basis	Exclusive focus on manufacturing. No information on additional components of production costs
<i>Unit labour costs in total economy (ULCTs)</i>	Deflator based on data referring to ULC dynamics in the whole economy	Largely available and provided on quarterly basis; less affected than the ULCMs from potential input substitution	Potential biases stemming from tricky measurement of service activities

Source: adaptation from Giordano and Zollino (2015)

The evolution of countries' price competitiveness is generally assessed analysing the change in REER. Nevertheless, the choice of the measure used to deflate the REER is open to continuous debate, since no standard measure is theoretically optimal. According to the adopted deflator, REER is defined as price-based - when relative consumer prices, producer prices of manufactured goods (PPIs) or GDP deflators are adopted-, or ULC-based -when unit labour costs in manufacturing (ULCM) or in the total economy (ULCT) are employed.¹³

Giordano and Zollino (2015, p.6) provide a summary of the most commonly used deflators, highlighting advantages and shortcomings in the way they affect the measurement of external competitiveness of a country. Consumer price indices (CPIs) are available on a monthly basis and are built according to a sufficiently-homogeneous methodology across countries. The calculation of CPIs includes both goods and services and are available for all advanced and a large number of emerging economies. The main drawback concerns the fact that CPIs focus on consumer goods only while capital and intermediate goods are excluded. Moreover, CPIs are subject to distortions due to the heterogeneity of fiscal measures. As in the case of CPIs, producer price indices (PPIs) are monthly indicators computed rather homogeneously across countries. Differently from CPIs, these deflators refer to all categories of manufactured goods (consumer, intermediate and capital), but do not provide any information on services. The GDP-based deflators provide information on all sectors and regarding all types of goods and services. Their major limitation, however, concerns the fact that they may differ across countries - due to the heterogeneous measurement of services' activity; and be affected by composition effects. ULCM-based deflators refer to manufacturing goods only. Therefore, they ignore additional components of production costs being unable to capture potential substitution between material inputs, labour and capital. The deflators relying on ULCTs include all sectors of the economy facing a lower risk of biases stemming from affected by input substitution – similarly, possible changes in sectoral interlinkages become irrelevant). However, they share the remaining drawbacks of ULCMs summed to biases related to the measurement of services.

A similar analysis can be found in the *Bundesbank monthly report* (Bundesbank, 2016) empirically assessing the performance of different price-competitiveness indicators in explaining international competitiveness. First of all, the report finds that a change in price competitiveness always exerts a statistically and economically significant long-term influence on exports. Secondly, it emerges that there is often no long-term relationship between indicators based on CPIs and real exports. Furthermore, both PPI and PCIs based indicators prove to be relatively unfavourable in providing exports forecasts. As a conclusion, the report states that indicators based on broadly defined aggregates, such as the deflator of total sales, the GDP deflator, or unit labour costs in the total economy are preferable.

The broad picture provided by Giordano and Zollino (2015) and by Bundesbank (2016), sheds light on the difficulty of identifying a univocal and accurate measure to evaluate competitiveness at the macro level. Moreover, it strengthens the position of the body of research questioning the reliability of price or cost measures as comprehensive indicators of international competitiveness of advanced economies. As Tiffin (2014, p. 19): '...price competitiveness measures have not always served as an accurate guide to subsequent trade developments. These measures, such as relative unit labour costs, are simple to communicate and are often linked closely to the instruments available to policy makers. But globalisation is reshaping the relationship between trade performance and price factors, with the latter providing less and less explanatory power for export growth...'

Thus, contributions on external competitiveness at a macro level are increasingly pointing at the role of non-price competitiveness in explaining countries', regions', and sectors' relative performance. Indeed, attempts to account for the role of technological change and innovation as drivers of competitiveness are put forth since the early stages of trade theory – *i.e.* the developments along the Heckscher-Ohlin framework. Jones (1970) proposed an extension of the Heckscher-Ohlin's model where production

¹³ Additional elements shaping the REER are the selected number of trading partners and of outlet markets as well as the chosen weighting scheme.

functions were allowed to vary across countries. As a consequence, factor price equalisation no longer holds due to the overwhelming role of technological differences dominating the ‘factor endowments’ determination. After Jones (1970)’s first attempt of relaxing assumptions of Heckscher-Ohlin on technology, Berglas and Jones (1977) introduced a mechanism of ‘learning by doing’ (Atkinson and Stiglitz, 1969) featured by local learning of the techniques effectively in use. In the same period, Findlay (1978) realised a steady-state dynamic model including technology transfer between ‘advanced’ and ‘backward countries’. Chipman (1970) proposed an extension - on the Kennedy-Von Weiszacker-Samuleson lines - assuming moving production functions and endogenous technological progress. In Purvis (1972) model, instead, factor mobility and trade emerge as complementary due to international technological differences and factor mobility.

Subsequently, deeper developments in the neoclassical model have emerged initiating the ‘new trade theory’. Ethier (1979 and 1982) introduced the hypothesis of increasing returns to scale – relaxing the perfect competition assumption and opening up the way for different welfare implications compared to the standard ones stemming from the Heckscher-Ohlin’s model – as determinants of trade patterns. The author found that the welfare effects of trade - when increasing returns hold – depend on the nature of such returns - national or international – as well as on patterns of change in relative prices. On similar lines, Melvin (1969), Kemp and Wan (1972) and Krugman (1979) developed models according to which imperfect competition – related to increasing returns to scale – may lead to gains from trade – for both the countries involved - but also to potential losses. Thus, extensions of the Heckscher-Ohlin’s model based on increasing returns can lead to opposite welfare outcomes compared to the one derivable from the original (Markusen and Melvin, 1981). Discussing this point, Dosi et al., (1990) identify the necessary conditions for the ‘gains-from-trade’ hypothesis – basically, the outcome of a trade model respecting all the ‘pure neoclassical’ assumptions - to hold: i) marginal pricing on the behavioural side; ii) convexity of the production possibility set on the technology side.

A further and path-breaking representation of technology-trade linkages is the one proposed by Krugman (1979 and 1983). According to Krugman model’s mechanics, an innovative North competes with a backward South. Within this framework, the North’s leadership – relying on the continuous birth of innovative firms – is challenged by low-wage firms operating in the South.¹⁴ The model outlines a dynamic of continuous innovation in the North and subsequent technology transfer towards the South, with the former ‘forced’ to continuously innovate so to maintain the leadership in trade relationships. Adopting a different set-up, Krugman (1983) shows that technological differences can emerge as a fundamental force driving comparative advantages. A related strand of literature (Krugman, 1983; Grossman and Helpman, 1990 and 1991; Markusen, 1989) operated a merge of ‘new trade’ and increasing-returns growth theories (see, among the others, Romer, 1986 and 1990; Aghion and Howitt, 1992). These models depict an economy where the steady-state ‘trade equilibrium’ properties are affected by an equilibrium rate of technological change which is endogenously determined.

All the above described departures from the Heckscher-Ohlin’s starting point moved from the recognition of a general inadequacy of the latter in explaining actually observed international trade flows as well as differences in terms of countries’ competitiveness. In particular, approaches referring exclusively to factor proportions – endowments and comparative advantages – as analytical instruments to describe dynamics and differences in trade and international competitiveness were found to be deficient of any connection with the available empirical evidence (Krugman, 1979). However, even the mentioned evolutions of the standard neoclassical approach – despite settled within a more realistic and enriched framework - share with the latter most of its strengths and weaknesses. Concerning the strengths, such models are able to handle through a simple theoretical - and mathematical - representation the interdependences between national and international markets. Regarding the weaknesses, the extensions of the Heckscher-Ohlin’s framework share with the original all the

¹⁴ The wage differential occurring between North and South in Krugman (1979)’s model is related to the rents exploited within Northern’s technology-leader firms.

unrealistic restrictions stemming from a ‘general equilibrium perspective’. In other words, all these models assume that: i) all the adjustments mechanism leading to equilibrium positions in international trade hold; ii) that such mechanisms work under a standard Walrasian price/quantity dynamics which automatically leads to the ‘clearing’ of all markets (Dosi et al., 1990 p. 24).

Thus, the basic assumptions characterising the streams of literature reviewed above do not allow to account for some key features of the ‘real’ world economy: static and dynamic economies of scale, continuous technological change, heterogeneity in observable and unobservable capabilities at country, industry and firm level, as well as various amount of unutilised labour and capital in all countries. Moreover, another major weakness of mainstream trade models regards the need to rely on standard maximisation procedures, implying agents’ rationality. As stated by Nelson and Winter (1982), it is hard to assume rationality and maximisation procedures as a representation of general behaviour, when technological change is properly accounted for. The latter, in fact, embodies radical uncertainty regarding choices and outcomes; patterns of change characterised by tacit heuristic and, to various extent, irreversibility.

Alternative branches of the literature have proposed explanations of the relationships linking international trade and technological change building on different conceptual pillars¹⁵: i) heterogeneity in technological levels and capabilities as key drivers of differences in export trends (and levels) across countries; ii) trade affecting the rate of macroeconomic activity of each economy - making unrealistic the hypothesis of equilibrium mechanism based on factors adjustments; iii) cumulative and irreversible nature of technological change and stickiness of consumption baskets iv) public or semi-public nature of technology and knowledge (on this point see Mazzucato et al., 2015); v) allocative patterns of international trade inducing ‘virtuous’ or ‘perverse’ cycles and feedbacks within economies in the medium-long run (Dosi et al., 1990).¹⁶

The analytical consequences deriving from the introduction of such hypothesis are quite relevant. In practice, accepting the five points made above means abandoning the idea of a ‘natural’ convergence among economies to be achieved through international trade’s adjustment mechanism - as implicitly assumed by the neoclassical model. The direct effect of the latter statement is the possibility to observe patterns of increasing divergence among countries determined by heterogeneity in degrees of capital accumulation; differences in technological and learning capabilities as well as in institutional factors (Freeman and Louca, 2001).¹⁷ Thus, under free trade conditions, static and dynamic economies of scale and differing income elasticities of the various commodities can lead to divergence and growth polarisation rather than to factor-price equalisation (an explanation of the present polarisation dynamics across European economies which relies on such hypothesis is provided in Cirillo and Guarascio, 2015).

Along similar lines, Kaldor (1966, 1970, and 1981) and Thirlwall and Vines (1982) formalised a multisector model of international trade. Such a model put forth a representation of international trade as driven by ‘asymmetrical’ patterns of change in technology and demand composition. In their framework, inter-factorial and inter-commodity adjustments as a response to relative prices and excess factor supply are of minor importance. Conversely, adjustments are driven by the level of industrial macroeconomic activity. A similar multi-sectoral model where demand plays a crucial role in determining evolution in technological capabilities and comparative advantages is the one proposed by Pasinetti (1981). In all these models, heterogeneity in income elasticities of various commodities - as

15 Among these contributions - widely heterogeneous in terms of scope and approach – are recognizable authors referring to the ‘technology gap’ or ‘product cycle’ theories as Posner, Freeman, Vernon, Hirsch, Kaldor and Thirlwall (Dosi et al., 1990 p. 26).

16 One of the principal aims of this Essay is to build a framework where such virtuous/perverse cycles involving technical change and international performances are clearly detectable.

17 One of the first critiques to the ‘equilibrium’ approaches to international trade has been putted forth at the beginning of the twentieth century by List (1904).

well as differences across countries in terms of technological capabilities – are able to produce ‘polarisation’ between economies. Paraphrasing Dosi and colleagues: ‘polarisation in innovativeness determines polarisation in growth’ (Dosi et al., 1990).

More recently, Giordano and Zollino (2015), comparing the relative TFP of the major Euro-zone (EZ) economies, find that relative TFP is positively and significantly correlated with EZ countries competitiveness, independently of the selected REER and across all countries, except France. In Italy, the authors find that the elasticity of relative TFP is approximately 1, lower than in Germany and, to a much greater extent, in Spain. Focusing on Italy, Tiffin (2014) find that export market shares have been preserved – after the 2008 crisis – by those firms relying on products quality, innovation, immaterial capabilities, and organisational flexibility. The importance of non-price factor as drivers of European economies’ export success is emphasised also by Cirillo and Guarascio (2015), and by Storm and Naastepad (2015) concentrating on the dynamics of the German economy after the 2008 crisis. The latter find that non-price factors – as innovation and products quality – are behind the quick and strong recovery experienced by Germany as opposed to that of the other EZ economies.

Another strand of literature emphasises the importance of the ‘enabling factors’ - intended as quality of institutions, law enforcement, infrastructures etc. – as elements contributing to spur countries’ competitiveness (see, among the others, Giordano and Tommasino, 2013, Giordano et al. 2015; Arduini and Zanfei, 2014; Zanfei, 2016). In this regard, Zanfei (2016) recognises that indicators reporting institutions quality are increasingly adopted as elements able to - at least partially – explain countries competitive performance. Similar considerations are in Giordano and Tommasino (2013), where an indicator on Italian institutions quality at the province level is developed. It is underlined how technological improvement of public services may be a key component of a pro-competitive environment. In particular, Zanfei (2016) finds that the adoption of ICT infrastructures for the provision of public goods and services may give a relevant contribution to the competitiveness of firms operating in such context.

From an empirical perspective, most of the (macro) competitiveness indicators provided by international organisations – as, for example, the World Economic Forum (WEF) or the World Bank (WB) – include measures of Public Administrations (PA) efficiency and effectiveness. The Global Competitiveness Index (GCI) elaborated by the WEF has within its components elements as: the level of property rights protection, the level of corruption, the incidence of conflict of interests, and the efficiency of the PA. In the case of Italy, for example, the set of elements linked to the quality of institutions seems to play the major role in driving the country down along the competitiveness ranking provided by the WEF. The *Doing Business Indicator* provided by the WB allows going deeper into the analysis of the efficiency of the PA – and, in doing so, to derive evidence concerning the relationship between quality of institutions and competitive performance of countries – reporting quantitative information on: procedures and costs faced to start a new company or to begin a new construction activity. Comparing Italy with the other major OECD economies, Zanfei (2016) find the relatively higher cost faced by those who intend to start a new company and the weakness of public sector innovation capacity are penalising Italian competitiveness.

As regards the use of ICTs within the provision of public goods and services, a comprehensive overview is provided by Cepparulo et al. (2013) and Zanfei (2016). Moving beyond previous analysis (Arduini and Zanfei, 2014) which focus on e-Government – that is, the ‘digitalisation’ of basic PA activities as public registry, collecting and monitoring tax payments, social contributions, etc. -, the diffusion of ICTs in ‘core’ PA sectors as health, transport or education, as well as public procurement is emphasised as a key factor enhancing competitiveness. Exploiting a new dataset allowing cross-country comparison between 15 European countries- the EIBURS-TAIPS database including information stemming from the PA offices of 229 cities out of the 322 EU15 ones monitored by the *Eurostat Urban*

*Audit*¹⁸ – Zanfei (2016) reported the results of the first empirical analysis conducted to evaluate quantity and quality of ICTs usage within the EU15's PA. The analysis focuses on the diffusion of public services through ICT infrastructure comparing the levels registered in the various EU15 economies. It emerges a certain degree of polarisation with the Northern countries (Denmark, Sweden and to a lower extent UK and the Netherlands) showing a level of ICT within public services provision above the EU15's average; as opposed to the Central (Germany, France and Belgium) and - to a greater extent – Southern ones (Italy, Spain, Portugal and Greece) falling short of the same threshold.

The increasing attention on the relation between institutions' quality and competitiveness corresponds to a growing amount of policy actions aimed at improving the former. In particular, strengthening public administration efficiency, lowering businesses' start-up costs and improving effectiveness and speed of judicial systems are largely seen as elements capable to positively affect firms and countries competitiveness. In this respect, a set of structural reforms directed at spurring institutions efficiency have been put forth in Europe as reaction to the 2008's crisis. This is particularly the case for Southern European countries as Greece, Italy and Spain where the larger number of reforms have been implemented (a specific focus on the Italian case is provided in subsection 5).

Finally, competitiveness of countries is also influenced by extensive and intensive margins – the former identified by the number of firms successfully collocating their products abroad, the latter by the amount of sales exporters manage to place in foreign markets. Meyer and Ottaviano (2007) emphasise the key role of extensive margin (number of firms exporting) in determining the relative competitiveness of countries. On similar grounds, the authors find that the number of exported products matters too. In other words, it emerges that larger countries have more exporters, export more products, and their exporters have smaller average exports per product.

Competitiveness at the sectoral level: the role of economic structures

In order to investigate properly how technological change, economies specialisation and industry-specific capabilities and trajectories (Dosi, 1982, 1988) contributes to international competitiveness, is crucial to take into account: i) the role of country and sectoral heterogeneity; ii) the uneven distribution of technological capabilities; iii) the uncertain, cumulative and irreversible nature of innovation as well as the structural interdependences involving technological advancements and economic performances (Guarascio and Pianta, 2016, p.2). All these features can be identified and theoretically conceptualised adopting –as is done by Dosi et al. (2015) - a partial disequilibrium approach as well as an evolutionary view of trade and innovation. From an empirical perspective, in turn, sectoral-level analysis allow to account for the set of features listed above.

Landesmann et al. (2015) point out that countries' competitiveness crucially depends on the relative strength of their tradable sectors. Moreover, it is emphasised the importance of preserving a solid and healthy manufacturing sector as a driver of technological change and innovation. Recognising the increasingly relevant role of manufacturing-related services, however, Landesmann et al. (2015) stress that what matters is not necessarily the dimension of the manufacturing sector. Rather, it is underlined how a healthy manufacturing sector should be characterised by: strong technological dynamism – *i.e.*, a high rate of R&D investment-, as well as good linkages, externally with GVCs and internally with suppliers of domestic services. The latter is of key relevance since manufacturing-services linkages are identified as important channels through which knowledge and technological spill-overs spread out.

In their contribution, Landesmann et al. (2015) provide an exhaustive analysis of competitiveness of OECD economies – analysed at the sector level. The authors rely on the recently released worldwide input-output database (WIOD) which allows to trace trade flows – intermediate and final goods – for 35 industries observed in 40 countries over the period 1995-2011. More specifically, they analyse the

¹⁸ The data drawn from EIBURS-TAIPS can be merged with information included in the Eurostat Urban Audit.

evolution of the competitive positioning of European industries as opposed to the one of major competitors as USA, Japan, and China. Furthermore, they account for production fragmentation, offshoring, and GVCs by comparing raw data on export and trade in value added. The main results reported by Landesmann et al. (2015) can be summarised as follows: European industries – particularly the medium-high and the high-tech manufacturing sectors – are preserving relevant market shares with respect to their main competitors; a strong polarisation between the core – Germany and the Eastern economies included in its manufacturing network – and the periphery of the European Union seems to increase along the considered period; China is increasing its international market shares in both low and medium high tech industries; the usage of trade in value added data emerge as a valuable complement to export data in order to have a more reliable picture of countries competitiveness.

An assessment of the importance of analysing competitiveness at the industry level can be found in Guarascio, Pianta, and Bogliacino (2016, p. 874). The latter shows how industry-level analyses allow to effectively account for the role of innovation related heterogeneity as well as feedback loops and structural interdependences between innovation inputs and outputs and international economic performance. Moreover, the authors emphasise how industry-level data allow to jointly consider the role of supply and demand factor in spurring productivity and, therefore, competitiveness.

The aim of the empirical analysis carried out by Guarascio and Pianta (2016) is to evaluate the relative importance of cost and technological factors – new products – in explaining European industries competitiveness. Their results show that both technological and cost competitiveness matter. First, they find a positive and significant effect of product innovation on export market shares reflecting a strategy of technological competitiveness in line with the Schumpeterian literature that previously investigated the relationship between technology and exports (see, for example, Dosi et al. 1990 and Fagerberg, 1988). Second, the introduction of new machinery – related to the improvement of technological capabilities and the reduction of costs – has also a positive and significant correlation with international performance; while lower unit labour costs contribute to higher cost competitiveness. Finally, imported intermediate inputs originating from high technology industries also contribute to higher export market shares. The latter element turns out to be crucial if the increasing importance of production fragmentation, offshoring and GVCs is taken into account. From this point of view, industry-level data provide a valuable resource since they allow to identify intermediate input flows as well as to compute a large range of offshoring and GVCs indicators – for a review, see Landesmann et al. (2015).

A specific focus on the European industries' competitiveness during the recent crisis is provided by Cirillo and Guarascio (2015). Using industry-level data drawn from the Sectoral Innovation Database (SID) developed at the University of Urbino (for a detailed description of the database see Bogliacino and Pianta, 2013) analyse the dynamics of jobs – distinguishing among workers professional categories – and competitiveness – looking at different indicators such as export market shares, R&D expenditure, share of tradable sectors - over-the period 2008-2014. They shed light on the process of polarisation already detected by Simonazzi et al. (2013) and subsequently explored by Landesmann et al. (2015). That is, they show how the core preserved and in some cases expanded its manufacturing base - particularly in medium and high-tech sectors – while the periphery experienced substantial losses – similar evidence has been recently provided by Lucchese et al. (2016). Moreover, it emerges that such polarisation spreads heterogeneously across workers penalising particularly medium and low skilled workers in European peripheral countries.

Competitiveness at the firm level: theory and empirics

What are the features of firms that successfully compete in international markets? To what extent do they contribute to productivity and employment? What are the policies that can improve a nation's foreign trade performance? What policies can promote the participation of other European firms that are currently excluded from international markets? Which are the gains and the adjustments involved in reducing barriers to trade and foreign direct investment (FDI)? These are some of the questions addressed by Meyer and Ottaviano (2007). See also Barba Navaretti et al. (2011) and Altomonte et al.

(2011, 2012) for empirical works addressing similar questions. Meyer and Ottaviano (2007) adopt a firm-level perspective. As a benchmark, we can quote Altomonte et al. (2011, p. 2)'s definition: '...we define competitiveness as the ability of firms in a given country – not of the country itself – to mobilise and efficiently employ (also beyond the country's borders) the productive resources required to offer goods and services. The factors affecting this ability range from firm-specific variables (such as the sector of activity, size, technology and so on) to macro/institutional ones (e.g., price/cost structure, investment environment and so on).

Firms gain access to international markets by means of different channels, including persistent or occasional export of goods and services; partnerships with foreign firms; and the set-up of foreign subsidiaries through FDI. As Barba Navaretti et al. (2011) put forth, during the last two decades internationalisation through FDI increased significantly due to the rise in the number of accessible markets. A large number of contributions (see, for example, Bernard e Jensen 1999; Barba Navaretti et al. 2011, Melitz, 2003) stresses the very peculiar nature of the group of firms resulting successful in exporting and internationalising. In particular, it is emphasised how the ability in penetrating foreign markets characterises specific clusters of firms within sectors where not all firms are capable of exporting and making successful FDI. From this point of view, an extensive literature investigates the characteristics of internationalised firms finding that their performance is strongly correlated with the former.

Meyer and Ottaviano (2007), Barba Navaretti et al. (2011) and Altomonte et al. (2011) find that firm size is strongly and positively correlated with firms' exports and FDI. The relevance of firms' size points to the role of internal resources – particularly resources needed to perform R&D activities – as a key element allowing big firms accumulating capabilities needed to penetrate foreign markets. A large literature has shown that R&D is financially constrained (Hall, 2002; Cincera and Ravet, 2010; Bogliacino and Gomez, 2014) due the intangible nature of R&D, which is difficult to collateralise and also due to informational problems, namely the 'radically uncertain' nature of research and the asymmetric distribution of information. As a result, big firms are expected to be better suited to overcome such barriers due to the relatively larger amount of resources and experience they are endowed with.

Similarly, contributions grounded on the 'Schumpeterian' tradition focuses on the relationship between firm size and R&D activities. According to this strand of literature it is possible to identify an effect of firm size on R&D (Cohen and Levin, 1989; Cohen, 2010). Since the introduction of the Schumpeter Mark II model, the concentration of R&D expenditures in larger firms has been identified as a stylised fact. However, this line of research has been criticised for being unclear as to whether it is innovation input or output that is affected by size and for the risk of endogeneity, given that both market structure and innovation are codetermined by the fundamental features of the sector (appropriability, cumulateness and the knowledge base, as explained by Breschi et al. 2000). The role of firm size as related to the availability of internal resources is underlined even in Dunning (1988) and Antras and Yeaple (2013). The latter argue that internal resources – intended as both monetary resources as well as intangible assets, knowledge, and capabilities – are a fundamental factor allowing firms to afford risks and costs related to the initial phase of 'settlement' in international markets. However, the prevalence of big firms among those resulting relatively more internationalised is partially reduced by the growing role of internationalised services - particularly firms operating in ICTs (D'Aurizio e Cristadoro, 2015) – where firms tend to have a relatively smaller dimension as compared to manufacturing. The causes driving firms' internationalisation are closely related with their competitiveness strategies. On the one hand, internationalisation – intended as the implementation of FDI, the opening of subsidiaries, the pursue of mergers and acquisitions – is often related to the search of opportunities to reduce costs. On the other, the access to high-tech and high-value GVCs may be the signal of strategies aiming at technological and quality improvement.

From a policy perspective, it emerges the need of promoting inflows of FDI so to ease the spreading of knowledge spillover which, in turn, are expected to spur competitiveness of domestic firms. Accordingly, a number of studies have investigated how product, labour market regulations and red

tape affect the way in which top corporate research and development (R&D) investors worldwide organise their cross-border operations. As an example, Ciriaci et al. (2016) identify a strong correlation between a better product market regulation (PMR) and MNCs' R&D investments. In particular, they found that among the different components of the PMR index, barriers to trade and investment have the greatest impact on location decisions, followed by state control and barriers to entrepreneurship. In particular, a one-point decrease of the barriers to trade and investment indicator leads to a 14.3 % increase of the probability of locate subsidiaries in a given country, versus a 9.5 % and a 3.5 % increase in the case of a similar reduction of the state control and barriers to entrepreneurship indicators, respectively. According to this evidence, lowering barriers to trade and investment, may facilitate the market uptake of new products and have the greatest impact in attracting foreign investments having positive effects on firms' competitiveness. This is particularly important for countries – as the Southern European ones – where investments are weak and where a low propensity to innovate of domestic firms is registered. Analogously, contributions have examined to what extent the magnitude and persistence of FDI inflows are correlated with regulation and institutional quality. Overall, the common wisdom refers to the need of a predictable product market regulation as well as of efficient judicial systems as key conduits of larger and more persistent cross-border investment flows. Ciriaci et al (2016) have shown that, given their current level of PMR, some EU countries (France, Lithuania, Sweden, Malta, Bulgaria, Latvia, Poland, Cyprus, Romania, Slovenia, Greece, Croatia) could particularly benefit from a reduction of PMR. In fact, by reducing rigidities in the product market, these countries would trigger the complementarity effect and become a more attractive location for MNCs' subsidiaries.

The Investment Plan for Europe recently launched by the European Commission follows this direction. In fact, in addition to providing a financial commitment, the Plan strongly focuses on innovation and productivity growth because of its 'third pillar', which aims to create an investment-friendly environment. According to the third pillar rationale, providing greater regulatory predictability, removing barriers to investment across Europe, and further reinforcing the Single Market (i.e. creating optimal framework conditions) will unlock the full potential of investment in Europe, including investment in R&D. More efficient product markets - alongside institutions and policies that allow productive firms to thrive - are recognised as key policy priorities also in the recent EC 5-Presidents Report (EC, 2015a).

The importance of innovation and non-price competitiveness in driving firms export performance is stressed by many authors. Among the latter, Wakelin (1998), Kumar and Siddharthan (1994), Enthorf and Pohlmeier (1990), and Hirsch and Bijaoui (1985) identify a strong and positive correlation between innovative activities and firms' international performance. Analysing the relationship between innovation and exports at the firm level, these contributions generally find that innovation - measured in terms of both input (e.g. R&D expenditure) and output (e.g. number of innovations), is a key factor in explaining export performance. Meyer and Ottaviano (2007) also stress the role of intra-industry heterogeneity. They emphasise that firms found to be highly competitive in international markets are (on average) larger, more productive, endowed with a diversified product portfolio and able to penetrate in a large number of foreign destinations. The crucial importance of firms' heterogeneity is at the basis of the model developed Grossman and Helpman (1991). Relying on a general equilibrium model - according to which only the more productive firms choose to serve the foreign markets and the most productive among this group will further choose to serve the overseas market via FDI – the authors find that more heterogeneity leads to significantly more FDI sales relative to export sales.

A large range of policy interventions can foster firms R&D activities. In particular, public subsidies are identified as an important to encourage firms to invest in R&D. Czarnitzki et al (2007) found a strong and positive correlation between public subsidies and R&D investments. Studying a sample of Finnish companies, the authors identify public subsidies as an important driver of firms' R&D activities. Without subsidies, recipients would show less R&D and patenting activity, whilst those firms not receiving subsidies would perform significantly better if they were publicly funded. Using the third and fourth wave of the Italian Community Innovation Survey (CIS3, years 1998–2000 and CIS4, years 2002–2004), a similar result is obtained by Cerulli and Potì (2012). Beside a positive relationship

between public subsidies and firms' R&D expenditure, Cerulli and Potì (2012) find no evidence of a crowding-out effect on privately financed R&D investments. As a result, increasing the public resources devoted to R&D subsidies may have beneficial effect on both the level and the dynamics of R&D activities. Adopting another perspective, Mazzucato (2015) emphasise the importance of a direct State intervention in large research projects characterized by great uncertainty, *i.e.* projects characterized by radical uncertainty and by large sunk costs. According to Mazzucato (2015), such intervention may generate an “innovation-friendly” environment that, once the State has covered the initial R&D costs, raises firms innovation propensity. In policy terms, Mazzucato et al. (2015) have proposed a plan of innovation-related and mission oriented investments for Europe as a way to restart growth and competitiveness. A strong emphasis is put on green activities which are recognized beneficial not only for their environmental and societal value but also because they are expected to generate high quality and high wages jobs.

In analysing firms' competitive performance, the heterogeneity of the former is recognised as a crucial issue to tackle even by the evolutionary firm-level literature. That is, heterogeneity has been largely investigated from an empirical standpoint shedding light on the ‘ubiquitous’ tent-shape distribution of most of the firms' economic performance variables (see, on this point, the stream of works starting with the pioneering contribution of Ijiri and Simon, 1977, and continuing, more recently, in Bottazzi and Secchi, 2006, and Dosi et al., 2016). Such empirical findings apply across different sectors, countries, over different historical periods and proving to be robust to different measures of growth (*i.e.* sales, value added or employment). The principal interpretation given to this (ubiquitous) pattern refers, on the one hand, to the heterogeneity of capabilities within firms; on the other, to the cumulateness of firms' growth processes – *i.e.* the ‘success breed success’ hypothesis. That is, the mechanisms of market selection - both in the entry-exit and in the market share reallocation processes – together with cumulative learning, is put forth as the more convincing explanation of tent-shaped distribution of firms' economic performance variables (Dosi et al. 2016).

Meyer and Ottaviano (2007) find that a handful of firms accounting for most aggregate international activity. The authors refer to this cluster of firms as ‘superstars’ identifying the latter as rare and characterised by a skewed distribution -an analogous evidence is found - concerning Italian firms - by Bogliacino et al. (2015). The presence of these clusters of high-growth, high-exports – and, in most of the cases, highly innovative – firms is found as rather homogeneous across country. This point is emphasised by Meyer and Ottaviano (2007) who focus on the European economies. They investigate the relative contribution – for the whole sample and for each of the European countries taken into account - of the top 1 %, 5 % and 10 % of exporters to a country total exports. Their numbers display the striking role exerted by such small group of firms. According to the analysis of Meyer and Ottaviano (2007), thus, the top 1 % of exporters account for more than 45 % of aggregate exports; the top 5 % of exporters account for more than 70 % of aggregate exports; the top 10 % of exporters account for more than 80 % of aggregate exports when all countries are pooled together. Results for single countries are less extreme but, overall, the overwhelming role of ‘superstars’ is confirmed.

Another element emerging from the firm-level analysis provided by Barba Navaretti (2011), Altomonte et al. (2011), and Meyer and Ottaviano (2007) concerns the relative importance of external and domestic markets for exporting firms. That is, it is explored to what extent, competitive firms tend to privilege external markets rather than domestic ones. From this point of view, results are weakly homogenous across countries (Meyer and Ottaviano, 2007, p.11). In fact, the latter find that only few firms export a large fraction of their turnover. They report that ‘...around 5 % and 25 % of firms export more than 90 % and 50 % of their turnover and account for roughly 10 % and 70 % of total exports...’. As said, however, this phenomenon is heterogeneously distributed across EU countries.¹⁹

¹⁹ Such heterogeneity – which is particularly striking between France and Germany – displays the differences in terms of relative importance of domestic markets in different EU countries. For Italy, 3 % and 25 % of firms export more than 90 % and 50 % of their turnover and account for roughly 7 % and 70 % of total exports.

As anticipated in the introduction, diversification is another feature characterising companies which are able to successfully compete on international markets. Particularly, many authors (on this element, see Meyer and Ottaviano, 2007 and Altomonte et al., 2011) point to the role of product diversification – i.e. the number of products exported by a single firm – and market diversification (i.e. the number of destinations for a firm’s products). It is found that top exporters export many products to many locations. Firms exporting more than ten products to more than ten markets account for more than 75 % of total exports according to the empirical analysis in Meyer and Ottaviano (2007). Thus, being able to diversify the products portfolio and find the way to get into a large number of foreign markets seems to grant firms a ‘competitive premium’. Paraphrasing Meyer and Ottaviano (2007, p.17), one can say that: ‘...aggregate exports are determined by a few top exporters that are relatively big and supply several foreign markets with several differentiated products. This points to the existence of a process through which only firms that are large enough and have a rich enough portfolio of products can withstand international competition...’

The support of firms’ internationalisation strategies is a key policy objective. This is particularly true for SMEs who may easily lack the necessary resources – in terms of both economic means as well as specific capabilities needed to access the foreign markets – to pursue successful internationalisation strategies. In this regard, policies aimed at supporting SMEs’ internationalisation may be of different kind. First, subsidies or tax discounts may be provided to encourage SMEs’ FDI and international activities. Second, public insurances directed at reducing part of the risks connected to the first steps of the internationalisation process may be offered. Third, specific instruments directed at favouring SMEs’ joint-ventures and partnership in international activities, so to help overcoming the barriers represented by the initial access cost in international markets, may be also be provided.

A closer look to the ‘anatomy of trade’ is provided in contribution analysing: the links between firms’ international activities, in terms of their technological and knowledge endowments, skills and relative wages (Serti et al. 2010); the drivers and the consequences of re-exporting, carry-along trade and two-way trade dynamics (Bernard et al. 2009; Damjian et al. 2013; Aristei et al. 2013). Regarding the former issue, a large empirical literature (Bernard and Jensen, 1995; Schank et al., 2007; Verhoogen, 2008) has shown that successful exporters are firms characterised by a relatively stronger skill intensity as well as by higher wages. Such characteristics add to the traditional evidence concerning dimension (exporters tend to be larger than other firms) and performance (exporters are also more productive). Making use of panel data on a large cross-section of manufacturing plants, Bernard and Jensen (1995) explore the role of exporting establishments in the US and provide a multitude of facts about exporting industries and exporting establishments. In their seminal contribution, the authors show that exporters are important in terms of size and employment in the domestic economy and that they have all the characteristics of currently successful plants. At any point in time, exporters are larger, more productive, and pay higher wages. Current export status, however, is a poor predictor of future wage and employment growth. Short- and long-term performance is conditional on the exporting status of the plant during the period under consideration; plants that become exporters grow the most, plants that cease exporting exhibit poor relative performance. Movement into exporting is associated with success.

Moving from these arguments, Serti et al. (2010) exploit a panel of Italian manufacturing firms and find that - conditional on firm size and capital intensity- exporters pay higher wages and employ more skilled workers than non-exporters. Remarkably, this finding proves to be robust to the consideration of factors referring to firms’ heterogeneity and ability to produce quality. Secondly, Serti et al. (2010) find that also imports are positively and significantly correlated with wages and with the share of high-skilled workers. Moreover, the authors show that, by including imports, the coefficients for exporters become lower than those observed for importers. This result points to the importance of the input composition of export goods which can partly explain such import-driven wage premium.

Posing their attention on two-way trade dynamics, Damjian et al. (2013) document that an important fraction of trade among firms involves simultaneous export and import of identical products. They define such phenomenon as ‘pass-on-trade’ (POT). Using data on imports and exports for Slovenian

manufacturing firms observed over the period 1994–2008, Damjian et al. (2013) shed light on the overwhelming relevance of pass-on-trade for the sample of firms they analyse. More specifically, it emerges how, on average, 70 % of all exporting firms engage in POT. This corresponds to more than 50% of all exported products. The interpretation that is given concerns, on the one hand, the importance of MNEs networks and, on the other, demand complementarities between firms' own and POT products. On similar grounds, Aristei et al. (2013) explore a large set of trade relationship – relying on a dataset including firm-level data for a group of 27 Eastern European and Central Asian countries from the World Bank Business Environment and Enterprise Performance Survey (BEEPS) over the period between 2002 and 2008 - to verify to what extent firms' engagement in both export and imports signals a two-way relationship. In this work, the authors estimate a bivariate probit model of the probability of exporting and importing. The evidence found in this paper show that the two-way link under investigation – that is, the correlation between serving foreign markets and sourcing inputs from abroad – is not there if size, productivity and other firm characteristics are controlled for. However, importing remains a positive driver of the probability of future exporting activities. The opposite does not hold true since serving foreign markets does not seem to affect the probability to source foreign inputs. The interpretation of this evidence points to the hypothesis according to which best performing firms self-select as two-way traders giving support to the idea that there may be some sunk-cost complementarity in importing and exporting activities. Furthermore, the positive effect of past importing on current exporting vanishes when we control for current firm productivity and product innovation. This is consistent with the idea that importing intermediate inputs enhances firm productivity and the propensity to introduce new products, which in turn fosters the chances of exporting.

As for the role of productivity, all studies dealing with firms' international competitiveness find that the latter tend to perform better as compared to domestically-oriented companies. Adopting a non-parametric technique, Meyer and Ottaviano (2007) build a ranking of firms located in the major European economies. They show how internationalised firms – identified in terms of both export success and FDI activities – are always above the other companies as regards productivity. In this respect, it can be argued that – without any claim of unidirectionality concerning the direction of such relationship – firms more capable of penetrating in foreign markets are also those performing better in terms of productivity. This element is closely connected to the role of process and product innovation which are two of the main drivers behind firms' productivity gains (on this point see the discussion in Bogliacino et al. 2015). The interpretations of the relationship between productivity and international competitiveness often stress two stylised facts. First of all, it is argued that the exposure to trade forces tends to push out from the market the least productive firms. Secondly, trade liberalisation seems to lead to market share reallocations towards more productive firms. Both the elements point to the importance of *market selection* –the importance of market selection as one the key factors underpinning the Italian performance is stressed also further below (see p.56). Several empirical contributions have investigated the dynamics of productivity growth in manufacturing sectors, finding significant rates of input and output reallocation across firms, even within relatively narrowly defined industries. In particular, these contributions focus on the reallocation of market shares across differently productive incumbent firms – the so called between effect –; second, of firm specific productivity gains or losses by the incumbent firms – the so called within effect –; and, third, of the turnover between entrants and exiters. Regarding market selection, the more relevant element is represented by the between component - which is commonly viewed as a measure of market-driven selection, in agreement with the intuition that market shares reallocation across firms should proceed in favour of more productive firms (or plants), while less productive units are expected to see their market share shrinking. On this point, the empirical evidence is mixed and is not completely clear if there is a clear association between higher productivity and increase in market shares – *i.e.*, more productive firms are also those who consolidate their market shares. Dosi et al. (2015), for example, analyse the process of market selection in manufacturing industries looking at a set of economies such as France, Germany, UK, and USA. Against the expectations, they find that within-firm learning prevails over market selection forces, with larger firms driving such innovation and learning processes. Moreover, the authors address the

“strength” of selection by exploring to what extent firm growth rates are shaped by relative productivity levels as compared to variation thereof. Despite changes in relative efficiency have a greater impact on growth than relative efficiency levels, there is an overall weak relationship between productivity and growth, and therefore a weak power of selection forces in all countries. The results hold across firms of different size. However, it emerges that selection bites more on SMEs.

Thus, many authors (Meyer and Ottaviano, 2007; Barba Navaretti et al. 2011; Altomonte et al. 2011, 2012) claim that the opening of distant markets gives an additional opportunity only to the most productive firms within each industry. Such process is expected to allow these firms to enlarge their market shares to the detriment of less productive competitors. In this way a selection process tending to penalise the least efficient is expected to gain strength. Such selection process triggered by the opening of foreign markets have been recently explained by different theoretical models. Among the latter, some stress the role of limited product differentiation resulting in tougher worldwide price competition when markets become more open. Other models emphasise the role played by sunk costs of export and foreign investment that only more productive firms can afford. Meyer and Ottaviano (2007) argue that this selection process is strengthened by falling mark-ups stemming from the increasing openness to global competition. Of course, firm selection’s intensity and dynamics may vary from country to country according to different sectoral specialisation, geographical positioning as well as bargaining power within GVCs.

The measurement of firms’ competitiveness is raising increasing attention in the literature (Altomonte et al. 2011; Castellani and Koch, 2015). The major issue concerns the availability of comprehensive datasets allowing to: i) obtain precise and consistent measures of competitiveness allowing to account for the multidimensionality previously stressed; ii) compare competitiveness measures in a sound way across countries and over time; aggregate micro-level data so to obtain ‘bottom-up’ indicators (Castellani and Koch, 2015) useful to compare countries competitive performance accounting, at the same time, for firms heterogeneous contribution the latter. Castellani and Koch (2015) provide a valuable review of the existing datasets reporting their coverage – focusing on European economies – both cross-country and over time; their degree of homogeneity and, thus, their comparability. In their work, the authors report information on the characteristics of both datasets and variables included in the latter with a specific attention to overlaps and redundancy of information, on one side; and on the degree of aggregability, on the other.

Measuring competitiveness in the GVCs’ era

This section briefly reviews contributions analysing competitiveness by looking at the role played by production fragmentation, offshoring, and GVCs’ developments. The importance of accounting for production fragmentation and GVCs when analysing competitiveness and trade among firms has been extensively stressed by Gereffi, Humphrey, and Kaplinsky (2001), Feenstra and Hanson (2001) and Timmer et al. (2013). All these authors agree on the fact that the worldwide interdependence of economic operations has dramatically reshaped firms’ competitive strategies and actions. As a result, both the understanding and the measurement of competitiveness has been substantially reshaped. From a theoretical point of view, the offshoring of production phases, the importance of MNEs, the dynamics of re-exporting as well as the dramatic increase of intermediate inputs flows require caution when relative competitiveness of countries and firms is analysed. In fact, remarkable export performance of a given country or region can hide a strong dependence of the latter in terms of imported intermediate inputs. In this respect, a sustained dynamic of exports - observed in a certain country - may not coincide with the generation and distribution of value added within the same country.

A key player of the dynamics of production fragmentation and globalisation are MNEs. From this standpoint, a wide and diversified literature dealt with the role of MNEs and their key role in the international organisation of production. See Ietto-Gillies (1992) and Cantwell (2000) for a map of different schools of thought within this strand of the literature. A different stream of research, in turn,

focuses on the relationships through which global buyers organise their transactions along the GVCs on a global scale (see Kaplinsky and Morris, 2001 for a review) and on the importance of these linkages for the performance of local suppliers. Another rather large set of papers study the changing nature of MNEs and their growing involvement in international collaborative ventures (see, for example, Mowery, 1988; Cantwell, 1989; Dunning, 1993, 1995). These contributions point to the changing organisation of MNEs, which are increasingly pushed to build linkages with foreign counterparts endowed with complementary competencies. From an empirical point of view, the importance of international alliances in the process of technological diversification and asset seeking strategies of multinational enterprises is explored by Granstrand et al., (1993), Cantwell and Piscitello, (2000) and Narula (2003), among the others. Zanfei (2000), and Castellani and Zanfei (2004) focus on the complementarities between internal networks of subsidiaries and external networks of cooperation with local firms and institutions, while Gomes-Casseres (1989) and Hennart and Larimo (1998) explore drivers and characteristics of alternative market entry strategies, including joint ventures and contractual agreements with local counterparts.

Moreover, as pointed out by Sturgeon (2001), the development of GVCs goes hand in hand with the increasing diffusion of knowledge flows. Saliola and Zanfei (2009) observe that knowledge transfer may occur involuntarily by means of human capital mobility, through the imitation of the technological and managerial practices of global buyers. Furthermore, knowledge assets may be transferred voluntarily by MNEs aiming at increasing the efficiency of their local suppliers (and to obtain access to local competencies on a reciprocity basis).

Gereffi et al. (2001) show that an increasingly large part of global trade is conducted within multinational enterprises or within network of firms linked together by means of specific contracting arrangements. These authors provide a large amount of evidence showing that such networks are crucially controlled by lead firms. These firms are predominantly located in developed countries and include not only multinational manufacturers, but also large retailers and brand-name firms. The leaders play a key role in specifying what is to be produced, how, and by whom. In more general terms, all intermediate stages of production may involve networks of firms located in different countries. As Altomonte and Rungi (2013) put it, production stages can be eventually organised by a company in two alternative ways: keeping the input production within its boundaries (vertical integration); or outsourcing it and engaging in arm's length contracts.

Investigating the relationship among hierarchical organisations of autonomous firms located in different countries – exploiting a unique dataset of 270.474 headquarters controlling more than 1.500.000 affiliates worldwide –, Altomonte and Rungi (2013) find how the participation in relatively more complex GVCs improves the productivity of firms involved in such chains. Interestingly, this result gives strength to the earlier findings in Garicano and Rossi-Hansberg (2015). According to the latter the flows of knowledge-intensive inputs with complex GVCs may contribute to productivity gains of companies. Similar evidence is found by Guarascio, Pianta, and Bogliacino (2016) who finds that the inflow of high-tech intermediate inputs contributes to push the international competitiveness of industries.

With a specific firm-level focus, Del Prete and Rungi (2015) build on the framework proposed by Antras and Chor (2013) to investigate the optimal allocation of ownership rights along a GVC. They rely on a dataset including information on 4.214 parent companies which have acquired or established at least one affiliate in the period 2004-2012. Del Prete and Rungi (2015) find that more productive and bigger parent companies are more likely to choose affiliates next to the final consumer. Once controlling for the complexity of the GVCs, it turns out that bigger internal chains are characterised by a lower propensity to integrate at the margin, probably due to increasing coordination costs. Giunta et al. (2012) focus on the performance of Italian manufacturing firms – observed over the second half of the Nineties- involved in the chain of subcontracting and outsourcing. More specifically, the authors empirically test whether subcontracting affects firms' growth dynamics, if upgrading along the GVC spurs growth, and explore the effect of geographical localisation on the relationship between subcontracting and firm performance. The main finding is that the subcontracting activities positively

affect growth. This is particularly true when the model's specification allows for nonlinear relationships between growth and subcontracting. Moreover, the strong dualism of the Italian industrial structure is confirmed (see the next section for a focus on the Italian competitiveness dynamics). Even among subcontractors, companies located in the Northern part of the country display a remarkably-stronger growth path as compared to the ones located in the South.

More recently, Accetturo and Giunta (2016) try to identify the impact of recent crisis on GVCs' organisation and on the behaviour of their belonging firms. In their contribution, the authors focus on firm-level data and compare the impact of the crisis in Italy and in Germany. Moreover, they explicitly take into account the positioning of firms along the GVCs - *i.e.*, if firms are intermediate or final firms. Their evidence show that intermediate companies have been affected comparatively more as opposed to final firms. Moreover, they find that human capital and technological endowment of firms- intended as the investments in human capital and product innovation before 2008 – significantly reduce such negative impact. Finally, they show that part of the heterogeneity detected between Italian and German firms can stem from different positioning and strategies within the GVCs. Another set of contributions, analysed the development of GVCs focusing on industries and relying on input-output techniques. Baldwin and Gonzales (2013) define 'supply-chain trade' the internationalisation of production which has given rise to complex cross-border flows of goods, know-how, investment, services, and people. Such process coincided with a deep change in the allocation of manufacturing production across the world, resulting in an increasing share of the latter localising in former Least Developing Countries (LDC) as China and India. Baldwin (2012) refers to these changes as the 'globalisation's 2nd unbundling'. According to Baldwin (2012) and Baldwin and Gonzales (2013), the 2nd unbundling is not just 'more goods crossing borders'. They argue that the recent increase in production fragmentation heightened the international mobility of managerial and manufacturing know-how. This determined – particularly in a group of nations located close to the US, Germany or Japan - the removal of bottlenecks previously hampering their industrialisation. These nations could industrialise by joining high-valued GVCs rather than 'building their own from scratch'. In terms of competitiveness, this booming industrialisation uplifted exports and terms-of-trade for commodity-exporters, thus creating a new class of commodity-reliant emerging markets. Such radical change in manufacturing share and in exports across the world is consistent with the evidence reported in Landesmann et al. (2015).

The global developments in production organisation substantially weaken former ways of conceptualising and measuring competitiveness. More precisely, looking at export data – eventually recognising the dramatic increase in export market shares experienced by a number of former LDCs – may lead to incomplete interpretation of countries relative competitiveness. What seems to matter, contrarily, is, on the one hand, the amount of value added that accrue to each economy according to its participation into GVCs – that is, accounting explicitly for direct and indirect trade flows; on the other, the power structure within the production chain – in other words, where the relevant decisions and the more crucial part of the production process are undertaken (Timmer et al. 2013; Foster et al. 2013).

The analysis of trade dynamics carried out accounting for production fragmentation and GVCs has been traditionally constrained by the lack of data. However, recent efforts to build datasets that allow tracing intermediate inputs flows and 'trade-in-value-added' dynamics have been conducted providing new valuable statistical sources. The WIOD database (Timmer et al, 2013) provides information concerning the country of origin of the input factors imported and the destination country of the exported products, further classified in intermediate and final goods. The OECD-WTO TiVA embeds analogous information as the WIOD but provides ready-to-use trade in value added which are useful to measure countries' competitiveness accounting for their participation in GVCs. Other sources commonly used in the literature include: the Asian Input-Output Table (IDEJETRO), the GTAP database, and the OECD inter-country IO Database (Baldwin and Gonzales, 2013).

The dynamics of competitiveness in Italy

Since the mid-nineties, the Italian productivity trend has been sluggish if not dramatically weak (Borin and Mancini, 2016; Calligaris et al., 2016). This is particularly true if the Italian dynamics is compared with the ones of its main competitors such as Germany. In this respect, stylised facts show that, in Italy, a moderately sustained labour market performance has come together with a weak real GDP growth. It emerged how a robust contribution of labour utilisation to GDP growth has been more than offset by a reduction in the contribution from labour productivity, resulting in weak overall GDP growth. Such persistently-poor dynamics of productivity has been analysed by a large number of contributions aimed at identifying the drivers laying behind it (for a review, see Codogno, 2009 and Calligaris et al. 2016). In particular, efforts have been put forth to understand to what extent these weaknesses – detected at the aggregate level - negatively affect international performance when the micro level is accounted for. . The next table summarizes the key contributions investigating drivers and characteristics of Italian firms’ competitiveness synthesizing adopted methodology and main results.

Selected contributions exploring Italian firms’ competitiveness

Authors and title	Dependent variable used to measure firms’ competitiveness	Data and methodology	Main results
Basile, R. (2001). <i>Export behaviour of Italian manufacturing firms over the nineties: the role of innovation</i>	Export performance defined as: the probability for a firm to export; and as the propensity to export for the exporting firms.	<i>Data:</i> Mediocredito centrale survey providing information on a representative sample of manufacturing firms observed between 1989-1997. <i>Estimation strategy:</i> Tobit model	Innovation capabilities emerge as the key driver of companies’ export performance.
Castellani, D. and Zanfei, A. (2007) <i>Internationalisation, Innovation and Productivity: How Do Firms Differ in Italy?</i>	Labour productivity, Total Factor Productivity (TFP) and innovation performance indicators (patenting, product innovation, process innovation, technological collaboration)	<i>Data:</i> the Second Community Innovation Survey (CIS) and the ELIOS (European Linkages and Ownership Structure) and Amadeus database. <i>Estimation strategy:</i> OLS, Tobit and Probit models	The authors find a strong association between companies’ internationalization (distinguishing between internationalization modes), productivity and innovative performance.
Dosi et al. (2012). <i>Turbulence underneath the big calm? The micro-evidence behind Italian productivity dynamics</i>	Labour productivity	<i>Data:</i> ISTAT Micro3. database providing information on more than 100.000 Italian firms. <i>Estimation strategy:</i> Non parametric analysis of Italian companies labour productivity distribution, OLS and quantile regressions	It emerges a correlation between companies productivity, investments and exports. However, such correlation is unevenly distributed both between and within sectors and size classes.
Minetti, R. and Zhu, S. (2012). <i>Credit constraints and firm export: Microeconomic evidence from Italy</i>	Exports	<i>Data:</i> VIIIth Survey on Manufacturing Firms by Capitalia-Unicredit <i>Estimation strategy:</i> Probit model using Instrumental Variables (IV) to control for selection	The authors find that the probability of exporting is 39% lower for rationed firms and that rationing reduces foreign sales by more than 38%
Daveri, F., and Parisi, M. L. (2015). <i>Experience, innovation, and productivity: empirical evidence from Italy’s slowdown</i>	Labour productivity (Y/L) and innovation dummies	<i>Data:</i> IXth Survey on Manufacturing Firms by Capitalia-Unicredit and Bureau Van Dijk AIDA balance sheet data. <i>Estimation strategy:</i> OLS, 2-step efficient GMM and LIML estimators	The authors find that Italian firms’ productivity is negatively affected by managers’ age and usage of temporary contracts.
Bogliacino et al. (2015). <i>The virtuous circle of innovation in Italian firms</i>	Turnover, innovation expenditure, innovative turnover and	<i>Data:</i> National Statistical Institute (ISTAT) panel providing information on firms innovative and economic	The results show the existence of cumulative feedbacks between successful innovations,

		performance <i>Estimation strategy:</i> 3SLS model	economic performance and the ability to sustain innovation expenditure
Giordano et al. (2015). <i>Does Public Sector Inefficiency Constrain Firm Productivity: Evidence from Italian Provinces</i>	Output/employee, Value added/employee,	<i>Data:</i> ORBIS (balance sheet data) and Doing Business survey (data on institutions efficiency at the province level) <i>Estimation strategy:</i> Fixed Effects-OLS model	The results suggest that raising public sector efficiency could yield large economic benefits: if the efficiency in all provinces reached the frontier, output per employee for the average firm would increase by 9 percent.
Calligaris et al. (2016). <i>Italy's Productivity Conundrum A Study on Resource Misallocation in Italy</i>	Total Factor Productivity (TFP) - descriptive exploration of factors determining resources misallocation among Italian firms.	<i>Data:</i> CERVED dataset providing information on Italian manufacturing and services limited companies; Bank of Italy's annual survey on Industrial and Service Firms (INVIND); and balance sheet data stemming from the Centrale dei Bilanci (CB).	Resource misallocation found as a key factor explaining: i) Italian companies' low productivity level; ii) survival of low productivity firms.
Borin and Mancini (2016). <i>Foreign direct investment and firm performance: an empirical analysis of Italian firms</i>	Total Factor Productivity (TFP) and employment growth.	<i>Data:</i> INVIND, Bureau Van Dijk-ORBIS, national datasets providing information about the foreign activity of Italian firms (Reprint, FATS, Direct Reporting) and balance sheet data are obtained from the Company Accounts Data Service (henceforth CADs). <i>Estimation strategy:</i> Propensity score matching	The authors find a strong impact of companies foreign investments on TFP as well as on employment, turnover and value added growth.

In a recent study of the European Commission (Calligaris et al., 2016), the Italian productivity disease is carefully analysed. A major emphasis is posed on resource misallocation and on its effect on aggregate productivity dynamics. In this study, the authors observe a persistent decline of Italy's TFP as compared to the performance of her main competitors. It emerges a clear slowdown in Italy's TFP dynamics since the middle of the 1990's, whereas in France and Germany TFP continued to grow until the global financial crisis. One of the factor which is connected to such productivity slowdowns has to do with a set of reforms undertaken in Italy from the mid 1990s onwards. In particular, the authors focus on the potential relationship between such reform intervention and the resource misallocation put at the basis of the weak TFP performance observable in the data. Calligaris et al (2016) point to the large set of privatisation – directed at privatising former state-owned firms. This process may have shifted resources from industrial or services activities with a high level of productivity to services characterised by low competition, high rents, and low productivity. This may have determined the TFP slowdown documented above.

Another set of reforms on which Calligaris et al (2016) point their attention are the intervention that – starting in 1997 with the so-called “Treu reform” (see Fana et al. (2016) for a chronicle of labour market reforms from the late 1990s onwards) – aimed at increasing flexibility of the Italian labour market. That is, the set of reforms aimed at introducing temporary contracts and at lifting firing restrictions so to ease workers' entry and exit. The authors note that, in Italy, the reform has created a ‘dual’ labour market where some workers are highly protected while others are highly ‘flexible’. Such a deep labour segmentation may eventually lead to more labour misallocation and to a de-anchoring of wages from labour productivity (Manasse and Manfredi, 2014). As we show later on, similar conclusions are drawn by Saltari and Travaglini (2009) and Fana et al. (2016).

An additional element identified as a potential cause of the Italian weak competitive performance regards the poor market selection dynamics²⁰. That is, market mechanisms expected to kick out firms when the latter are characterized by poor productivity performance seems to be not particularly effective in Italy (Landini, 2016). Such weakness of market selection mechanisms is commonly related to the presence of rigidities which ensure competitive rents - *i.e.*, market advantages due to idiosyncrasies of the firm's demand. Comparing the dynamics of market selection during the Great recession in the major European economies, Landini (2016) find that such dynamics is weakest in countries – *i.e.* such as Italy – more severely hit by the crisis. This finding have two major policy implications. On the one hand, policy makers should devote more attention - beside measures aiming at reducing rigidities in product market - to policies that foster firm competition and eliminate the sources of competitive rents (transportation costs or institutional elements such as long-term buyer-supplier ties²¹). This kind of policies are particularly relevant since, even in presence of input flexibility, firms benefiting from competitive rents can continue to operate independently of their relative inefficiency. On the other hand, the exceptional fragility of countries like Italy which suffered major losses after the crisis may require the adoption of non-standard policy actions (such as direct state aid towards specific sectors) so to ensure the effectiveness of standard market-based policies directed at removing rigidities and competitive rents.

Most studies emphasise heterogeneity as a key element for disentangling causes and consequences of Italy's weak productivity performance. In fact, besides a poor productivity performance registered at the aggregate level, Italy seems to be characterised by a relevant degree of heterogeneity in terms of competitiveness and international performance. Particularly, Italy reveals a sustained export dynamics during the last two decades, a dynamics continuing even after the 2008 crisis (Tiffin, 2014). All the explanations point to the existence of a solid cluster of firms able to export, gain, and defend positions in relevant international markets. Italy seems to be affected by a dualism: on the one hand, firms characterised by weak productivity performances and mainly relying on domestic demand; on the other, internationalised firms exporting and, in some cases, undertaking FDI's show remarkable competitive performances as well as ability to defend and enhance their market shares (on these topics, see Castellani and Zanfei, 2007; Borin and Mancini, 2016; D'Aurizio e Cristadoro, 2015; Cozza and Zanfei 2014; Bogliacino et al. 2015).

In acknowledging the existence of such heterogeneity, a growing number of studies explored the characteristics of Italian exporters – or, more in general, the features of Italian internationalised firms. These efforts are aimed at identifying elements explaining the international success of such (small) cluster of Italian firms. A particular emphasis is given to: the relative importance of price and non-price competitiveness factors, such as product and process innovation, products quality, and complexity (Basile, 2001; Castellani and Giovannetti, 2010; Bogliacino et al. 2015); the role of firm size, ownership structure and management strategies (Borin and Mancini, 2016); the linkages with local institutions and GVCs.

An early attempt to characterise Italian exporters is the one of Basile (2001). The latter analyses the relationship between export behaviour of Italian firms and their innovation capabilities considering three different years: 1991, a period characterised by a fixed exchange rate regime; 1994, that is after the exit of the Italian currency (Lira) from the European Rate Mechanism (ERM) and its strong devaluation; and in 1997, after a strong appreciation of the REER. Studying both the probability for a firm to export and the propensity to export for the exporting firms, Basile (2001) studies the correlation between the latter and a set of covariates including new products, new processes, labour cost, firms size, ownership characteristics, and geographical localisation of firms. The export performance of the set of Italian firms analysed by Basile (2001) turns out to be significantly driven by product innovation.

²⁰ For a review of the recent empirical contributions analysing the dynamics of market selection in various economies see the previous sub-section.

²¹ See Landini, 2016 p. 4.

Contrarily, cost factors - as labour costs per unit of product - seem to play a marginal role. Interestingly enough, the positive correlation between exports and product innovation strategies seems to weaken when a major currency devaluation occurs – as in the case of the 1994’s test carried out in the paper.

Another set of contributions explores the heterogeneity of Italian firms’ performances based on the evolutionary approach (Dosi and Nelson, 2010; Dosi, 2012). These authors show that firm performance - measured in terms of a number of variables, including sales, productivity and exports - is characterised by persistent heterogeneity, and by cumulative processes that are specific to firms sharing specific characteristics in their knowledge base and business strategies (Dosi et al., 2010). In this regard, several studies have investigated the dynamics of innovation, growth, and productivity of Italian firms. Building on longitudinal micro-evidence on Italian manufacturing firms, Dosi (2007) explores the statistical distribution of firm performance variables. It emerges how the idiosyncratic components of firms - principally their innovation efforts - drive the process of change in such distributions. However, the process of market selection appears to play a minor role in affecting the patterns of growth because differential efficiencies do not reward more successful firms in terms of growth. Using a large dataset on Italian manufacturing microdata produced by ISTAT, Dosi et al. (2012) find a strong intra-sectoral heterogeneity of firms along labour productivity and growth rates.

Focusing on Italy, a large number of works focused on the differences between internationalised and domestically-oriented firms - see, among the others, Ferragina and Quintieri (2000), and Castellani (2002). Another stream of literature analyses heterogeneity focusing on firms performing FDIs and on multinationals (Barba Navaretti and Castellani, 2004; Casaburi et al., 2009; Castellani and Zanfei, 2007; Castellani and Giovannetti, 2010, Cozza and Zanfei, 2014). Relying on a matching model, Barba Navaretti and Castellani (2004) compare productivity dynamics of a group of firms observed after their decision of locating their production abroad; against a control group, which is not internationalised. The authors find internationalised firms to substantially outperform the control group. Merging Community Innovation Survey (CIS) data on firms’ innovative activities with data on ownership structure (ELIOS), Castellani and Zanfei (2004) show that internationalised companies perform relatively better in terms of both value added and TFP. Furthermore, Castellani and Giovannetti (2010) find that firms’ innovative performance is positively correlated with the degree of internationalisation. The interpretation of this finding points to the role of R&D activities and managerial skills which are expected to be stronger in internationalised firms.

In their contribution, Barba Navaretti et al. (2004) test whether the attitude towards internationalisation and offshoring is one of the drivers of better economic performance of Italian firms. They focus on MNEs aiming at identifying the effects of investments in “cheap-labour” countries on firm performance – measured in terms of sales and employment growth. The econometric analysis is carried out comparing a group of firms that invested in cheap-labour economies with one that did not – used as counterfactual. Implementing a propensity-score matching model, the authors find no evidence of a negative effect of outward investments to cheap labour countries. Firms that invest in cheap labour countries seems to enhance the efficiency of home activities, with also positive long-term effect on output and employment growth. Focusing again on the impact of foreign investments on Italian firms’ performance, Barba Navaretti and Castellani (2004) find that investing abroad significantly enhances domestic performance. Using an identification strategy analogous to the one outlined above, they find that the rate of growth of total factor productivity and of output is significantly higher for investing firms and accelerates after the investment takes place. Their results are robust to the inclusion of different controls. Remarkably enough, they find no significant effect on employment growth. This evidence shows that foreign investments are an important strategic move – for Italian firms - to strengthen home activities.

The role of labour force quality and skills as drivers of Italian firms’ competitive performance is explored by Castellani and Giovannetti (2010). In their paper, the authors examine the relationship between the use of knowledge workers and TFP dynamics. The analysis is conducted exploiting an original dataset on Italian firms and distinguishing between R&D workers, workers in managerial, and clerical occupations. According to their results, TFP differences are not only the outcome of different

constant in the production function between international and non-international firms; but they rather reflect differences in the slopes of the production function. In fact, allowing for different returns to inputs between domestic and international firms, Castellani and Giovannetti (2010) are able to explain all of the TFP premium and beyond. The interpretation of this result points to fact that MNEs are both more capital intensive and exhibit higher returns to capital. Furthermore, they find that managers and capital are complements in the productivity of multinational firms. This element is consistent with the idea that multinational firms have superior organisational capabilities and managerial practices.

From a policy perspective, the evidence reported above highlights the importance of FDI inflows and of market selection as elements favouring the enlargement of the cluster of competitive firms. In particular, the presence of MNEs can result in cooperation and knowledge spillover towards domestic firms. On similar lines, a more diffuse presence of internationalised firms may work as an incentive to push other firm towards more intense international activities. As mentioned previously (see p.48), product market regulation, administrative and judicial efficiency may emerge as crucial factors in creating a context favourable for FDI inflows and MNEs' investments – particularly in R&D activities (Ciriaci et al., 2016). In this respect, structural reforms aimed at cutting down rigidities in the product market – such as barriers to open up new enterprises – or at spurring judicial efficiency may affect positively the rate of FDI inflows. Moreover, well-calibrated R&D subsidies could have a positive effect on firms' investments. Such subsidies, however, should be accompanied by specific policy instruments directed at sustaining R&D activities of SMEs. This is particularly relevant in a context as the Italian one where the average-size firm tends to be relatively small. Moreover, SMEs face relatively more often financial constraints due the lack of collateral, particularly during crisis period. Therefore, an effective policy mix aiming at enlarging the set of firms able to compete successfully on foreign markets should be directed at: i) reducing product market regulation ii) fostering administrative and judicial efficiency iii) favouring firms R&D investment and internationalisation through subsidies.

Building on a recently developed dataset, Borin and Mancini (2016) investigate if and to what extent Italian firms' internationalisation strategies affect their productivity. The authors use a propensity-score matching technique to properly identify the effects of internationalisation on firms' performance. The effect appears to heavily depend on the country of destination of the investment and on the belonging industry of the firm. More specifically, MNEs investing in advanced economies are found to be characterised by better performance along a broad array of measures (turnover, value added, employment and capital).

D'Aurizio and Cristadoro (2015) perform a descriptive analysis comparing firms according to their 'international status'. The set of Italian firms included in their sample are distinguished between those selling their products only domestically, firms exporting but not making any FDI, as well as firms both exporting and performing FDIs – such distinction builds on the one proposed earlier in Castellani and Giovannetti (2010). The analysis developed by D'Aurizio and Cristadoro (2015) highlights remarkable heterogeneities across the three groups. They find a hierarchy according to which firms belonging to the exporters-FDI cluster are characterised by a relatively-stronger performance in terms of sales, value added, and employment. Such cluster is followed by the one including exporters while firms selling their products only domestically show poorer performance with respect to all the considered indicators. Regarding the belonging sectors of more successfully-internationalised companies, D'Aurizio and Cristadoro (2015) find that the large majority of firms both exporting and investing on foreign markets are in the chemical and in the manufacturing industry. The authors also find that firms belonging to this group are generally large in size and localised in the Northern part of the country.

The international performance of firms has been analysed with respect to a number of additional factors playing a significant role in shaping the Italian economic context. A branch of literature deals with the links between *family management* and international performance of Italian firms. Expanding on previous contributions by Corbetta (1995) and Montemerlo (2000, 2005), Cerrato and Piva (2012) exploit a large sample of Italian manufacturing SMEs, and show that the involvement of the owning family in management negatively influences export propensity. However, they also find that once the choice to go international has been made, the degree of internationalisation of the firm is not

significantly different with respect to the composition of the management team. An analogous exercise is carried out in Bannò et al. (2015) empirically studying a set of 293 Italian MNEs. Bannò et al. (2015) attempt to answer to the following question: does family management affects the internationalisation capabilities of Italian MNEs? The authors find that family management – intended as both ownership and management held by family members – has a negative impact on MNEs’ ability to compete in international markets. On the contrary, the involvement of family’s new generations as managers seems to have a positive effect on internationalisation.

A related issue is the *education of managers* and the impact the latter has on companies’ competitiveness and performance. Focusing on middle managers, Feltrinelli et al. (2013) investigate through an econometric model if training activities improve managerial practices being, in turn, a driver of companies’ competitive advantage. Their econometric exercise relies on a sample of Italian manufacturing firms observed over the 2006-2011 period and reporting information on both balance-sheet data and internal training. Using GMM techniques, Feltrinelli et al. (2015) find robust evidence in favour of a positive relationship between middle managers vocational training and a set of performance measures as ROI, ROE, and TFP. Similar findings are in Cucculelli and Micucci (2008) where the impact of the founder–chief executive officer (CEO) succession is analysed. Their results show that the maintenance of management within the family has a negative impact on a firm's performance. All these evidences confirm the findings in Bianco et al. (2013) in exploring the differential sensitivity to uncertainty of family and non-family firms in Italy. It emerges that family firms’ investments are significantly more sensitive to uncertainty than non-family firms. They interpret such evidence as related to the greater opacity of family firms and to their higher risk aversion, rather than to the degree of sunk fixed capital as argued by the previous literature on investment decisions.

The relation between *quality of institutions* and Italian firms’ competitiveness is examined, among the others, in Daniele and Marani (2011) and in Lasagni et al. (2015). The aim of both contributions is to test the hypothesis that macro-factors, particularly the quality of institutions, play a role in explaining the heterogeneity of performance within Italian firms. More specifically, Daniele and Marani (2011) test whether the presence of organised crime – an element signalling strong weaknesses and fragility of institutions – affects the inflow of FDIs in Italian provinces. This element is particularly relevant since - as it has been shown previously - foreign ownership and participation in GVCs is a key element driving the international performance of firms localised in Italy. They find that organised crime is negatively and significantly associated with firm FDIs. This result holds even when an indicator of financial incentives for investment is included in the model.

Nifo and Vecchione (2012) propose an Institutional Quality (IQ) indicator structured into 24 elementary and 5 aggregate dimensions regarding some major quality characteristics of a governance system resulting from the aggregation of simple indexes whose values are gathered from official sources and surveys conducted by public, private and non-governmental institutions. Lasagni et al. (2015) exploit this indicator to empirically test if institutions’ quality contributes to explain firms’ heterogeneity in TFP. Analysing a sample of Italian manufacturing companies observed between 1998 and 2007, the authors find that firms showing a relatively stronger TFP dynamics are those localised in areas where the IQ displays higher levels. That is, in line with previous contributions exploring this relationship, a good institutional framework contributes to spur firms’ competitiveness.

The factors analysed above – *i.e.*, quality of institutions, education of managers, and family management – testify the presence of relevant country specificities affecting - both positively and negatively - the performance of Italian firms. In this respect, policy actions directed at fostering firms’ competitiveness should be designed accounting for such characteristics. Concerning the quality of institutions, administrative efficiency turns out to be the major issue in Italy. The role of institutions quality in affecting competitiveness has been recently analysed by Giordano et al. (2015). They study the effect of public-sector efficiency– relying on the indicator developed in Giordano and Tommasino (2013) - on firm productivity using data from more than 400.000 firms across Italy’s provinces. They find that inefficiency in the public sector significantly reduces the labour productivity of private firms. More in detail, Giordano et al. (2015) state that if public sector efficiency rose to the frontier in all provinces,

firm productivity, measured as output-per-euro spent on salaries, could increase by up to 22 % in the sectors with higher dependence on the public sector, while gross value added per employee costs could rise from 2 to 10 %. For the average firm, output would expand by 3 %. However, the presence of inefficient institutions having a negative effect on firms' performance is found to be largely uneven across regions and provinces. From this point of view, policy actions should focus particularly on the areas – the Southern regions - lagging behind in terms of both institutions' quality and economic dynamics. This is particularly important since the recent crisis - see, among the others, Fana et al. (2016) - has deepened the Italian regional dualism pushing Southern regions further backwards.

Regarding the education of managers, an effective policy strategy to enhance the latter may be based on instruments favouring both firms' partnerships and internationalisation (the positive effects of internationalisation are detected by Bogliacino et al. 2015). In fact, opening up firms' organisation to international collaborations and foreign competition is likely to stimulate the acquisition of new managerial practices. Internationalisation, moreover, may emerge as an effective tool to soften the distortions related to family management practices.

The role of financial markets and credit rationing as factors affecting export performance is studied by Minetti and Zhu (2011). They estimate - after controlling for productivity and other relevant firm attributes - the impact the effect that credit rationing exerts on Italian firm exports. They show that the probability of exporting is 39%-lower for rationed firms and that rationing reduces foreign sales by more than 38%. Moreover, the authors show that credit rationing impacts more than proportionally foreign sales rather than domestic turnover. In addition, credit rationing seems to have a relatively stronger negative impact on firms operating in medium and high-tech sectors. The role of credit rationing is explored also by Caggese and Cunat (2013). The latter study the interaction between financing constraints and export activity. Using firm level data for Italy, they show that credit constraints at the level of the firm reduce the productivity gains deriving from trade liberalisation, as constrained firms are less likely to enter the export market.

A different stream of literature focuses on the linkage between the competitiveness of institutions and companies, looking specifically at the labour market. The main hypothesis is that different labour-market institutions can have heterogeneous effect on firms' competitiveness strategies. Focusing on the flexibilisation of the labour market – *i.e.*, reduction of firing restrictions and introduction of temporary contracts - authors as Saltari and Travaglini (2009) and Fana et al. (2016) connected the Italian poor productivity performance to the flexibilisation introduced in Italy from the late nineties onwards– these arguments are in line with the findings in Lucidi and Kleiknecht, (2009). Both Saltari and Travaglini (2009) and Fana et al. (2016) point to the fact that more flexibility may push firms towards strategies of cost competitiveness rather than to stronger innovation. From this point of view, the hypothesis of a negative relationship between labour-market flexibility and the diffusion of technological-competitiveness strategies gives strength to results as the ones in Daveri (2006). Exploring a sample of Italian firms, the latter shows that lacking innovation is at the roots of poor productivity performance. All in all, the dynamics of competitiveness in Italy seems to be characterised by a significant degree of heterogeneity (a group of firms which are competitive and capable of significant performances on the international markets and another one displaying poor productivity and relying mostly on domestic demand); and by the presence of a plethora of factors – specific characteristics of Italian firms, cost and technological competitiveness strategies, enabling factors as the institutional environment, ownership structure and participation in GVCs, family management and education of managers or credit rationing - contributing to explain, on one side, the existence of such distinct clusters and, on the other, the performance of internationalised firms.

The literature summarized in this section sheds light on a set of peculiarities characterizing behaviour and performance of Italian firms. In particular, most of the reviewed contributions highlight a significant divide between companies showing remarkable competitive performances - regardless the considered measure of performance – associated with high innovation rates and strong export orientation; and a cluster of low-productivity/low-performance firms displaying scarce innovation and internationalization propensity. Many contributions link such pervasive dualism – a dualism that,

indeed, has a negative impact on the whole economy innovative and economic performance – to a set of long-lasting problems affecting the Italian socio-economic system. More specifically, institutional inefficiencies, presence of corruption, lack of infrastructures, companies with low R&D and innovation propensity – i.e. all problems affecting more intensively specific areas such as the Mezzogiorno – are all factors driving down firms’ competitiveness. These factors, moreover, go hand in hand with a number of structural features – i.e. a large majority of small and micro enterprises over the total population of firms, diffusion of family management practices, strong product market regulation and low internationalization as compared to other European economies, – contributing to reduce the space for a generalized improvement of Italian firms competitiveness.

The Italian companies’ peculiar situation emerges in a clear-cut way if the literature on Italian firms’ competitiveness is compared with analysis exploring such dynamics at the EU level. According to the empirical analysis carried out by Meyer and Ottaviano (2007) and Altomonte et al. (2011), for example, the better performance - in terms of export success and capacity to penetrate in new foreign markets - of French and German firms as opposed to Italian ones can be explained by a set of factors such as: large presence of firms performing R&D activities and innovation; infrastructures easing technology transfer and innovative spill-overs among firms; adequate human capital endowment; a financial system supporting innovative investments as well as the development of start-ups; diffusion of management practices favouring innovative and internationalization activities. All in all, the studies focusing on EU’s best performers as the key German exporters point to the importance of an “innovation and internationalization friendly” ecosystem helping to reinforce firms’ competitiveness at both the intensive and the extensive margin.

Despite some of these elements are present in Italy - and this is testified by the performance of Italian companies gaining and preserving international market shares – these are distributed in a scattered and inadequate way. Moreover, the intensity of some specific weaknesses – such as low R&D expenditure, a comparatively lower share of people with tertiary degree as compared to the EU average or the public administration inefficiencies - tend to reduce the impact of positive elements as the Italian entrepreneurs’ ingenuity or the ability to develop high-quality products. From this point of view, policies aimed at fostering Italian firms’ external competitiveness should proceed along two directions. On the one hand, a set of policies acting on the supply side is needed to: ease the process of market selection favouring the entry of new innovative firms and the exit of less productive ones. On the other hand, a set of structural and demand side policies is needed to: upgrade the infrastructural system; reduce the geographical divide; enlarge the supply of high skilled workers by increasing education expenditure.

Conclusions

This section has provided a review of the large and heterogeneous literature addressing the concept of competitiveness. Without any pretence of completeness, the review aims at tackling the multidimensional nature of competitiveness. That is, the literature on competitiveness is summarised and inspected emphasising: i) multidimensionality in the component of performance with respect to which competitiveness is considered; ii) the point of view from which competitiveness is evaluated – micro, meso, or macro; iii) the role of GVCs and MNEs; iv) the relevance of non-price competitiveness factors; v) the interrelatedness between multidimensionality of the concept and ways of measuring competitiveness.

Moreover, we focus on the dynamics of competitiveness in Italy. Focusing on the firm-level of analysis, a set of factors characterising the competitive performance of Italian firms are put under the lens: the Italian ‘dualism’, that is the co-existence of a cluster of exporters showing strong competitive performance and a group of low-productivity firms mostly relying on domestic demand; the role of institutions quality and other enabling factors in explaining firms international performance; the importance of ownership structure, family management, manager education and geographical localisation.

Overall, the reviewed contributions provide some key elements helping to explore such multidimensionality of competitiveness. First, heterogeneity - among countries, sectors, and firms – is one of the fundamental features emerging from all the analyses of competitiveness and international trade: firms are heterogeneous due to their characteristics in terms of size, technology, management and ownership structure; sectors are heterogeneous due to their intrinsic technological characteristics resulting in different paradigms and trajectories; countries are heterogeneous with respect to their comparative advantages as well as to their endowments in terms of enabling factors. Second, this review highlights the importance of adopting both a micro and systemic approach in analysing competitiveness. On one hand, the focus on firms allows to capture characteristics, behaviour, and strategies of the true actors of competitiveness (Krugman, 1994). On the other hand, the analysis of firms' competitiveness must go hand in hand with an account of micro-macro relationships –; the endogenous feedbacks going from the macro environment to the behaviour of firms and vice versa, as well as with a consideration of the role of firm networks and spill-overs.

4 THE DRIVERS OF EXTERNAL COMPETITIVENESS: MICROECONOMIC EVIDENCES

This section investigates heterogeneities in the drivers of external competitiveness. By drawing from the large body of research comparing internationalised enterprises and domestic firms, it devotes attention to the differences between exporters and non-exporters in terms of structural characteristics, performance and strategies. The descriptive statistics provided in this chapters provide a framework that is further analysed by means of econometric estimates in a dedicated section.

The evidences show that:

- Italy has been hardly hit by the crisis: its value added is still far from being fully recovered even though in the recent years some positive signs emerged.
- The recent recession had a deep repercussion on the evolution of the population of firms. Between 2011 and 2014, the number of manufacturing firms passed from 425,121 to 396,422 units. Despite a widespread negative result, the aggregate data is the consequence of huge regional disparities, with the Southern Regions showing the most extremes cuts in the industrial population.
- By comparing the size-class distribution of Italian firms with those detected in the other European peer economies it turns out that the share of micro-sized companies (1-9 employees), over the entire population of manufacturing firms, whilst being much larger than the German one, is actually similar to -and slightly below- the French and Spanish ones.
- The picture changes radically when considering the contribution of micro-sized firms to the total value added. Indeed, the percentage of total value added produced by Italian micro-sized companies (11.9%) outstrips those exhibited by their European counterparts (8.3 % for France, 9.6% for Spain, and 3.4% for Germany).
- This peculiar feature can be ascribed to the low relative contribution of large (over 249 employees) Italian companies to the overall value added, ranking last among, and lying far from, those of its main competitors. This follows both from a relative lower presence of this class within the industrial population and from poor labour productivity levels. At the same time, the modest relative weight of Italian large firms is also connected to the prominent role played by the small and medium enterprises (10-249 employees) whose productivity levels stands out among their European analogues.
- Whilst able to join international markets, micro firms remain more grounded in the domestic market than their larger counterparts. Indeed, business activities with less than 10 employees are very often ‘marginal exporters’ with more than 85 % of total turnover coming from domestic markets and, in-between 2011 and 2013, more than 40 % of micro-sized exporters returned to a domestic dimension. These two weaknesses are strongly intertwined one each other.
- The aggregate dynamic of foreign and domestic markets impacted on firms’ expectations and access to fundamental resources, triggering different strategic behaviours among business organisations. Many companies started to look abroad for new business opportunities in order to cope with the difficulties faced on the domestic market. Other firms preferred to remain on local or national markets only, either because unable to start an export activity or because the local/national scale represented their strategy to survive the recession.
- The analysis of firm level data has further confirmed the well-known differences between internationalised and domestic companies along a wide range of structural, behavioural and

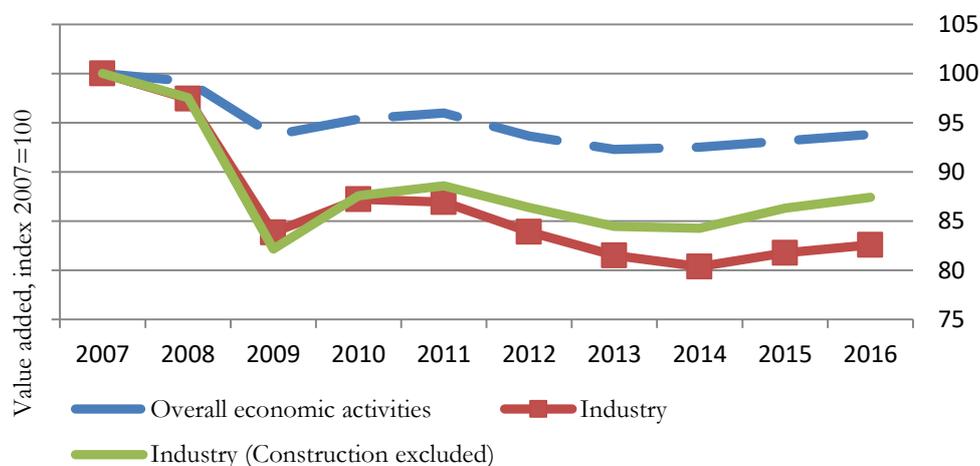
performance dimensions. In particular, firms able to reach foreign markets tend to display the characteristics of complex organisations (larger, older, belong more often to corporate groups) and are more technologically advanced (more productive, more innovative, with larger shares of high-skilled workers).

- When moving from characteristics to performances, the differences between exporters and non-exporting firms translate into better economic outcomes. In terms of value added growth rates, between 2011 and 2014, exporters grew faster -or shrunk more slowly- than domestic business activities. This is also a consequence of the diverging trends followed by domestic and foreign demands.
- These differences stand out not only in average terms but also along the entire distribution of the phenomenon.
- Other than structural characteristics and performances, export activities are strongly associated with strategies aimed at improving technological and organisational capabilities. To this extent, innovations play a central role in this matter for they represent the way through which business organisations seek to gain an advantage over their competitors. Indeed, exporters tend to introduce new products (29.2 %), new processes (19.8 %) and new organisational practices (17.9 %) more often than domestic firms (12.6 %, 8.6 %, and 8.4 % respectively).

4.1 THE EVOLUTION OF THE ITALIAN INDUSTRIAL SECTORS DURING THE CRISIS: A BRIEF INTRODUCTION

During the second phase of the crisis (i.e. the “sovereign debt” one) Italy witnessed a diverging trend between domestic and foreign demands. While many European peer economies (see Figure B.1) were starting to recover from the fallouts of the financial crisis, the Italian one continued to struggle in the face of a dwindling internal demand. Indeed, the outbreak of this new downturn dampened the mild rebound started in the wake of 2009 (Figure C.1). As a result, after almost 10 years, the overall economic performance has not recovered yet and the aggregate value added still lags behind its pre-crisis levels, despite a light U-turn displayed since 2015.

Figure C.1: Value added evolution during the crisis



Note: To compute index numbers we used the chained linked series of the gross value added with reference year 2010. The industry sectors include: mining and quarrying, manufacturing, electricity, gas, steam and air conditioning supply, water supply, sewerage, waste management and remediation activities, and construction.

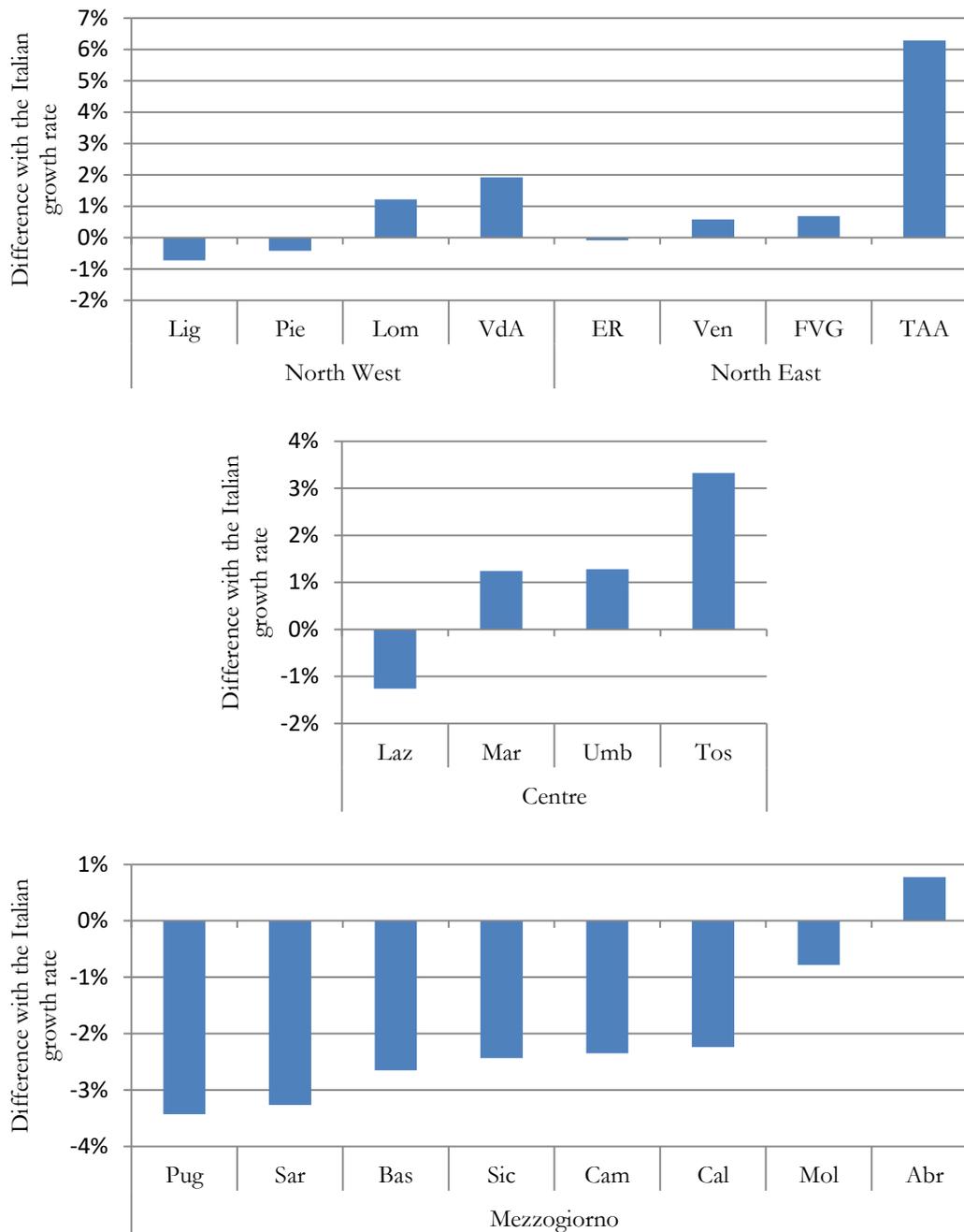
Source: ISTAT.

Table C.1: Value added growth rates and evolution within Italian industrial sectors

	Average annual value added growth rates			value added in 2015 as a share of the value in 2007
	2008-2015	2008-2010	2011-2015	
Industry (construction excluded)	-1.6	-3.9	-0.3	86.3
mining and quarrying	3.7	-7.8	10.6	127.5
manufacturing:	-1.5	-4.0	0.0	86.8
<i>in detail:</i>				
food products, beverages and tobacco products	-0.2	-1.9	0.9	98.3
textiles, wearing apparel and leather products	-1.3	-3.9	0.3	86.9
wood and paper products, and printing	-2.6	-4.2	-1.6	80.7
coke and refined petroleum products	6.9	-19.8	22.9	24.1
chemicals and chemical products	0.4	-0.2	0.7	97.2
basic pharmaceutical products and pharmaceutical preparations	1.9	1.6	2.1	115.1
rubber and plastic products, and other non-metallic mineral products	-2.1	-3.9	-1.1	83.1
basic metals and fabricated metal products, except machinery and equipment	-1.6	-5.2	0.6	84.4
computer, electronic and optical products	-3.0	-5.8	-1.3	77.1
electrical equipment	-2.1	-1.5	-2.5	81.3
machinery and equipment n.e.c.	0.0	-1.5	0.9	96.7
transport equipment	-1.5	-7.6	2.2	84.2
furniture, other manufacturing, repair and installation of machinery and equipment	-3.7	-6.0	-2.4	72.9
electricity, gas, steam and air conditioning supply	-2.9	-3.0	-2.9	78.3
water supply, sewerage, waste management and remediation activities	-2.4	1.6	-4.8	81.7

Source: ISTAT.

Figure C.2: Changes in firms' population 2010-2015 (%) within the Italian regions



Note: The bars reported in the charts represent the difference, in percentage point terms, between the regional and the national industrial population's growth rates over the 2010-2015 period. Growth rates have been calculated in two steps. First, we took the difference between firms that registered for the first time at a regional Chamber of Commerce and those that ceased of being registered during the 2010-2015 period. Subsequently, we divided this measure by the overall number of business activities registered in 2009. In order to control for removals from a Chamber of Commerce register due to a change in firm's location, we excluded the so called "cessazioni d'ufficio" from the count of deaths. The regional data refer to the Italian NUTS 2 administrative areas: Valle d'Aosta (VdA), Piemonte (Pie), Lombardia (Lom), Liguria (Lig), Emilia Romagna (ER), Veneto (Ven), Friuli Venezia Giulia (FVG), Trentino Alto Adige (TAA), Toscana (Tos), Umbria (Umb), Marche (Mar), Lazio (Laz), Abruzzo (Abr), Molise (Mol), Puglia (Pug), Campania (Cam), Basilicata (Bas), Calabria (Cal), Sicilia (Sic), and Sardegna (Sar).

Source: elaborations on the archives of all the Italian Chambers of Commerce, 2010-2015.

Table C.2: Population of Italian firms by size class

	2011		2014	
	N	%	N	%
<i>Total economy</i>				
Micro (1-9)	4045763	94.94	3871988	95.13
Small (10-49)	190690	4.47	174032	4.28
Medium (50-249)	21453	0.50	20639	0.51
Large (250 or more)	3406	0.08	3378	0.08
Total	4261312	100	4070037	100
<i>Manufacturing</i>				
Micro (1-9)	350727	82.50	328486	82.86
Small (10-49)	64280	15.12	58390	14.73
Medium (50-249)	8850	2.08	8349	2.11
Large (250 or more)	1264	0.30	1197	0.30
Total	425121	100	396422	100

Source: elaborations on microdata from the Italian National Institute of Statistics (ISTAT).

At the macro-sectoral level, the Italian industry has been severely hit by the lack of a sustained domestic demand. Indeed, even without considering constructions, the industrial value added falls below the 90% of that produced in 2007. This is the result of a wide range of different sector-specific performances where isolated outstanding positive outcomes –such as those shown by ‘mining and quarrying’ and ‘pharmaceutical products’ - are coupled with the fall of many branches of economic activities (Table C.1). Just to mention few of the latter: in 2015 the value added generated by ‘textiles, wearing apparel and leather products’ amounted to 86.9% that generated in 2007, with an average annual growth rate between 2008 and 2015 equal to -1.3%. In a similar vein, the value added created in 2015 by the production of ‘electrical equipment’ corresponds to 81.3% that created by the same sector in 2007, and the average annual growth rate during the 2008-2015 period reached -2.1%.

All these dynamics have had a deep repercussion on the evolution of the population of firms. According to the data provided by the Chambers of Commerce, between 2010 and 2015 the overall number of companies that made an application for a registration decreased by about 10.8%. On top of that, despite a widespread negative result, the aggregate data is the consequence of huge regional disparities. Indeed, the comparison between regional and national growth rates of registered business activities shows that Southern Regions have suffered the most while many Central and Northern Regions exhibited less extremes cuts in the population of firms (Figure C.2).

Overall, in the last years the number of manufacturing organisations passed from 425,121 in 2011 to 396,422 in 2014 (Table C.2). This strong reduction, however, has not significantly changed the size class distribution of the population. As a matter of fact, micro-firms (1-9 employees) remain the predominant class accounting for about 82-83% of the total number of manufacturing companies, while SMEs (10-249 employees) reach the 16-17% and large enterprises (250 and more employees) are steadily the 0.30% of the population. Obviously, this evidence does not mean that the crisis hit evenly all the classes: as a matter of fact it is reasonable to assume, for example, that medium-sized organisations were more likely to shrink to small dimensions rather than failing at once. Yet, on balance, the data on the population point out that the crisis has not affected the characteristic size distribution of Italian firms.

By comparing the size-class distribution of Italian firms with those detected in the other European peer economies it turns out that the share of micro-sized companies (1-9 employees), over the entire population of manufacturing firms, whilst being much larger than the German one, is actually similar to -and slightly below- the French and Spanish ones (Table C.3). The picture changes radically when

considering the contribution of micro-sized firms to the total value added. Indeed, the percentage of total value added produced by Italian micro-sized companies (11.9%) outstrips those exhibited by their European counterparts (8.3 % for France, 9.6% for Spain, and 3.4% for Germany).

Table C.3: Distribution within manufacturing of number of firms and value added by size classes (%)

	Size classes in terms of employees				
	0-9	10-19	20-49	50-249	250 or more
	Number of firms				
EU 28	82.9	8.0	5.1	3.4	0.8
Germany	65.1	17.4	7.7	7.8	2.0
Spain	84.1	7.4	5.5	2.5	0.4
France	87.6	5.4	4.1	2.4	0.6
Italy	82.9	9.9	4.8	2.1	0.3
	Value added (at factor cost)				
EU 28	6.7	5.5	8.8	22.8	56.1
Germany	3.4	4.4	5.2	19.7	67.3
Spain	9.6	7.0	13.9	26.8	42.7
France	8.3	5.0	9.2	20.3	57.3
Italy	11.9	11.5	15.6	27.7	33.3

Source: elaborations on EUROSTAT data.

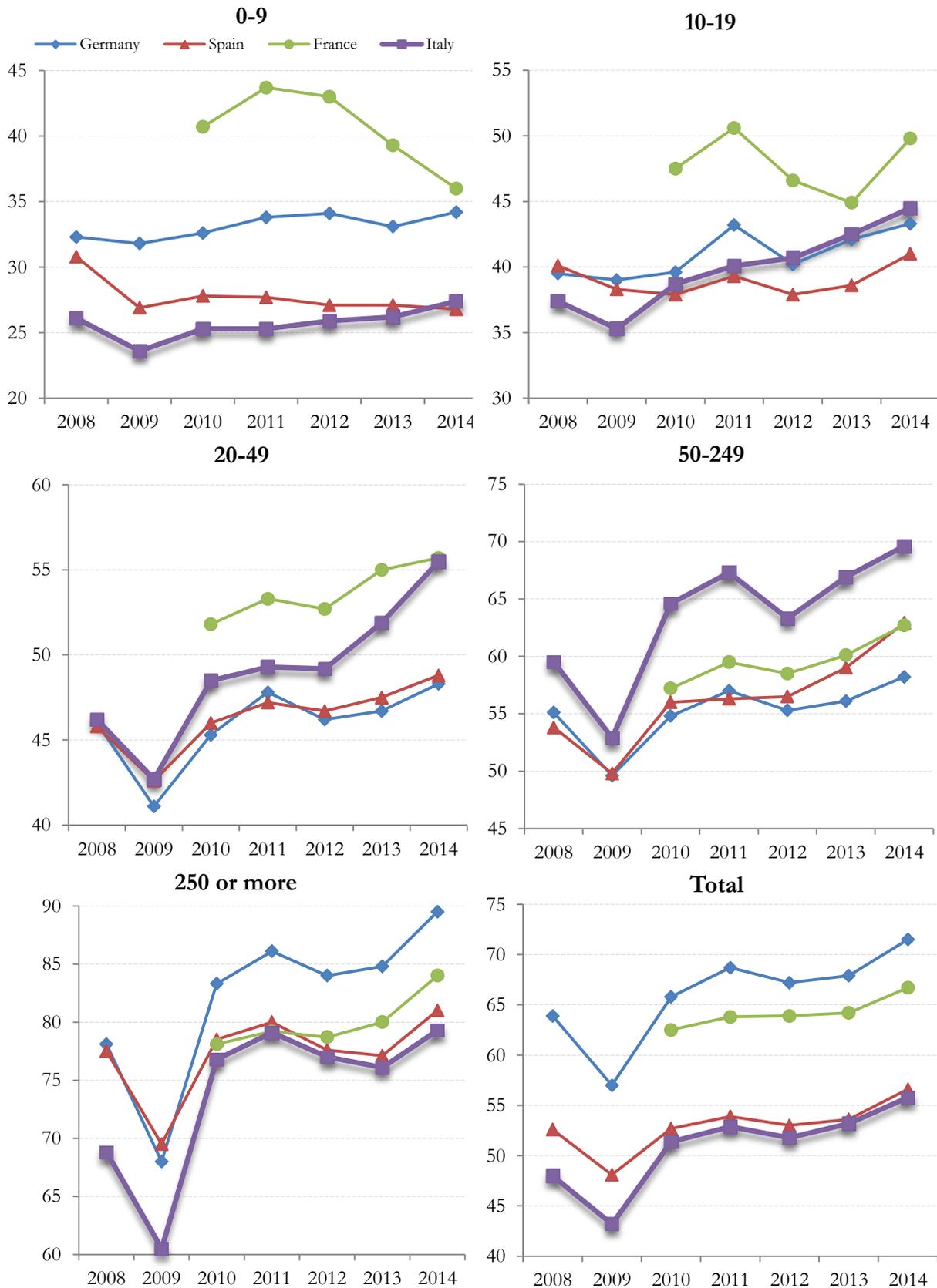
This peculiar feature can be ascribed to the low relative contribution of large (over 249 employees) Italian companies to the overall value added, ranking last among, and lying far from, those of its main competitors. This follows both from a relative lower presence of this class within the industrial population and from poor labour productivity levels. At the same time, the modest relative weight of Italian large firms is also connected to the prominent role played by the small and medium enterprises (10-249 employees) whose productivity levels stands out among their European analogues.

As a matter of fact, the aggregate data on Italian labour productivity hide a large degree of heterogeneity among the different size classes. Figure C.3 plots the evolution of the apparent labour productivity, measured as gross value added per employee²², by size class across the European countries of interest. Overall, the productivity level of Italian manufacturing ranks in the last position, even though, in recent years, its trend has been in line with the other ones. The scarce aggregate productivity follows from the conduct of the opposite extremes among all the size classes, i.e. micro- and large-firms. In relative terms, the productivity gap between Italy and the other countries is negatively affected by the performances of smallest enterprises. Thus, rather than by their excessive presence, Italy is hindered by micro-sized firms' ability to set on the same productivity levels of their European counterparts.

To this extent, the analyses of microeconomic dynamics in the following pages must be interpreted in the light of a scenario characterized by a high degree of heterogeneity in terms of both performance and strategies at the firm level. The aim of the inspection is to highlight and dig deeper into this heterogeneity.

²² Unfortunately the size-class breakdown of value added per hour worked, more suitable when one needs to take into account the degree of heterogeneity in the average hours worked across different countries, is not provided by official statistics.

Figure C.3: Apparent labour productivity (Gross value added per person employed), thousands of euro



Source: EUROSTAT.

4.2 EXPORTERS VS NON-EXPORTING FIRMS

The dynamic described in the previous pages impacted on firms' expectations and access to fundamental resources, triggering different strategic behaviours among business organisations. Many companies started to look abroad for new business opportunities in order to cope with the difficulties faced on domestic markets. Other firms preferred to remain on local or national markets only, either because unable to start an export activity or because the local/national scale represented their strategy to survive the recession. These behaviours generated two diverging patterns within the overall population following from the different risks faced by the two groups. In fact, as shown by ISTAT census data on the population of active firms, between 2011 and 2014, the number of exporters went through a mild increase (+1.8 % within the entire population and +0.04 % within manufacturing sectors), while the number of business activities selling their products and/or services within national borders experienced a significant reduction (about 4.8 % for the whole economy and 8.5 % among manufacturing sectors) (Table C.3).

These differing patterns are also the outcome of differing evolutions of size classes. Among non-exporting firms, small and medium business activities experienced a very large decrease in the number of their members (-15.5 % and -12.3 % respectively) while micro and large businesses exhibited significant but less extreme declines (-7.8 % and -3.5 % respectively). These movements, however, changed only marginally the size-class distribution, which has remained heavily concentrated around the smallest dimensions. Indeed, more than 90 % of non-exporters fall within the group of firms with 1 to 9 employees.

On the contrary, data on exporters show a lower degree of concentration around micro-sizes. In fact, exporters take more often on small, medium and large dimensions. Nevertheless, it is worth emphasizing three points on this matter. To begin with, whilst representing a smaller percentage of firms than their non-exporting counterparts, in 2014 micro-sized exporters accounted for more than 1 out of 2 Italian business activities selling products abroad (65 % in the whole economy, 51.5 % in manufacturing sectors). As such, their presence appears all but negligible.

Secondly, their weight among exporters (in terms of number of companies) is comparable to those observed in other European peer economies, such as France and Spain, and not far from the German one (see Table B.4 in Chapter 2). To this extent, the presence of very small organisations able to reach foreign markets seems to be more a widespread characteristic of industrial economies rather than a peculiar feature of the Italian industrial system.

Thirdly, their importance (in numerical terms) has increased throughout the last period of the crisis. As a matter of fact, Table C.3 shows that, in manufacturing sectors, their weight among exporting firms passed from 49.39 % in 2011 to 51.52 % in 2014. Indeed, the net increase of the total number of exporters has been exclusively brought about by the net increment of this class of internationalised business activities. On the contrary, both SMEs and large companies went through a reduction in the number of their exporting members.²³

²³ For further information on micro exporters see the dedicated box below.

Table C.4: Exporters and non-exporting firms

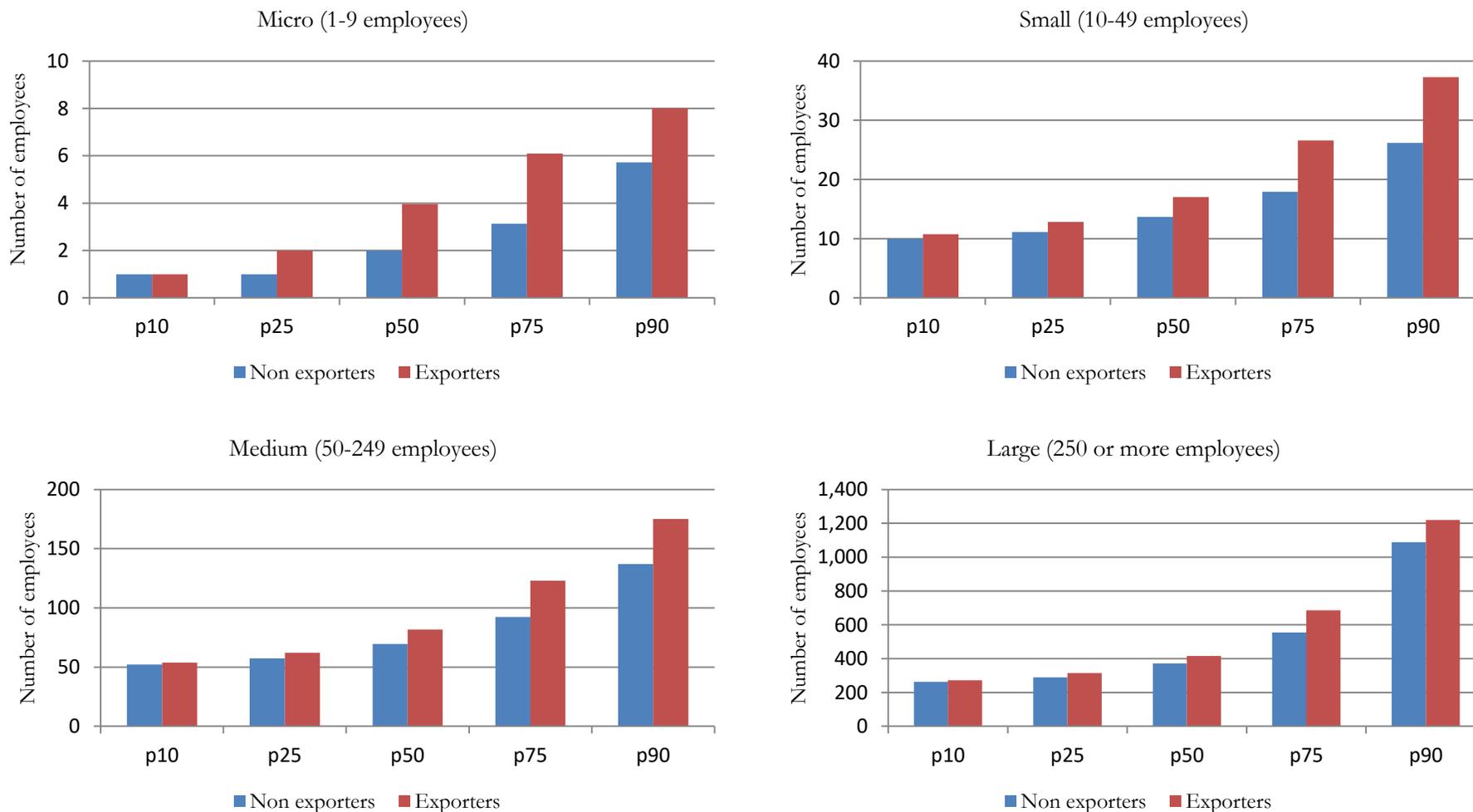
	2011				2014			
	Non exporters		Exporters		Non exporters		Exporters	
	N	%	N	%	N	%	N	%
<i>Total economy</i>								
Micro	3929937	96.37	115826	63.14	3750622	96.58	121366	65.02
Small	135639	3.33	55051	30.01	120815	3.11	53217	28.51
Medium	10793	0.26	10660	5.81	10439	0.27	10200	5.46
Large	1514	0.04	1892	1.03	1514	0.04	1864	1.00
Total	4077883	100	183429	100	3883390	100	186647	100
<i>Manufacturing</i>								
Micro	307333	91.12	43394	49.39	283208	91.79	45278	51.52
Small	28921	8.58	35359	40.25	24431	7.92	33959	38.64
Medium	986	0.29	7864	8.95	865	0.28	7484	8.52
Large	29	0.01	1235	1.41	28	0.01	1169	1.33
Total	337269	100	87852	100	308532	100	87890	100

Note: Size classes are defined according to the number of employees. ‘*Micro firms*’ include business organisations with 1-9 employees. ‘*Small firms*’ encompass all those companies with a number of employees falling within the range 10-49. ‘*Medium firms*’ are those business activities with 50-249 employees while ‘*Large firms*’ refer to organisations with 250 or more employees.
Source: elaborations on microdata from the Italian National Institute of Statistics (ISTAT).

Provided that, the tendency of exporters of being larger than non-exporting businesses stands out clearly in ISTAT census data, holding even when the analysis focuses on the distribution of firm-level employees within each size class. Indeed, as shown in Figure C.4, the main percentiles of the distribution of exporters’ employees always outstrip the corresponding percentiles of the distribution of non-exporters’ workers. Moreover, the gap increases (in absolute values) when moving from the smallest toward the largest percentiles of each size-class distribution, by implying that the range of sizes reached by domestic companies is narrower than that reached by business activities trading on foreign markets.

Such an evidence suggests not only that firm size is correlated with the ability to export, but also that this correlation does not simply follow from the presence of extraordinary large exporters or specific groups of firms acting exclusively on the median value of the distribution. Indeed, the fact that the entire distribution of exporters’ size is shifted rightward with respect to the non-exporters’ one reveals a very strict connection between these two phenomena. At the same time, however, the fact that exporters are distributed across all the classes (micro-firms included) underlines that these size differences have to be interpreted more in relative than in absolute terms: exporters tend to be larger than domestic firms, without necessarily being large.

Figure C.4: Firm employees distribution within each size class (percentiles)



Note: Data refer to the population of Italian manufacturing firms in 2014.
 Source: elaborations on microdata from the Italian National Institute of Statistics (ISTAT).

Moreover, the number of employees working within a firm could be interpreted as a proxy for its degree of organisational complexity. As a matter of fact, the larger the number of people within the firm, the larger the number of possible tasks carried out within its boundaries. To this extent, the differences in terms of employees reflect the fact that business activities trading on foreign markets are able to manage and coordinate a greater amount of resources and capabilities than the other ones (Teece and Pisano, 1994).

This seems also to be confirmed by the comparison of structural characteristics between the two groups. Indeed, as shown in Table C.4, exporters exhibit the traits most commonly associated with complex organisations. To begin with they tend to be more mature than non-exporting companies by displaying a higher proportion of business activities elder than 10 years. Since complexity has to do with knowledge, and (technological) knowledge is highly path-dependent (Nelson and Winter, 1982), the positive correlation between export and age may be linked to the correlation between complexity and past experience.

A second characteristic linking exporters to complex structural organisations refers to their higher propensity to belong to corporate groups. In particular, within the subset of business activities with more than 49 employees, the share of exporting companies taking part to a business group overcomes 70 %, whereas the corresponding value for domestic businesses fall short of 64 % (Table C4). It is also worth pointing out that this propensity sharply increases when passing from small (27 % for exporters, 13.6 % for non-exporting firms) to medium enterprises (70.5 % for exporters, 52.7 % for non-exporting firms), thus suggesting the presence of a structural break in-between these classes.

Table C.5: Firm structural characteristics

	Share of total firms elder than 10 years (%)		Group membership (%)		Share of employees with tertiary education (median)		Labour cost per employee (median - thousands of euros)	
	Non exporters	Exporters	Non exporters	Exporters	Non exporters	Exporters	Non exporters	Exporters
Micro	58.6	62.0	2.80	8.70	0.00	0.00	21.6	27.9
Small	65.4	80.3	13.6	27.0	0.00	5.40	29.2	36.4
Medium	66.2	86.3	52.7	70.5	4.20	8.50	34.3	44.4
Large	75.0	87.2	64.3	95.5	6.50	11.6	38.7	49.9
Total	59.1	71.5	3.80	22.2	0.00	0.90	22.9	33.6

Note: Data refer to the population of Italian manufacturing firms in 2014.

Source: elaborations on microdata from the Italian National Institute of Statistics (ISTAT).

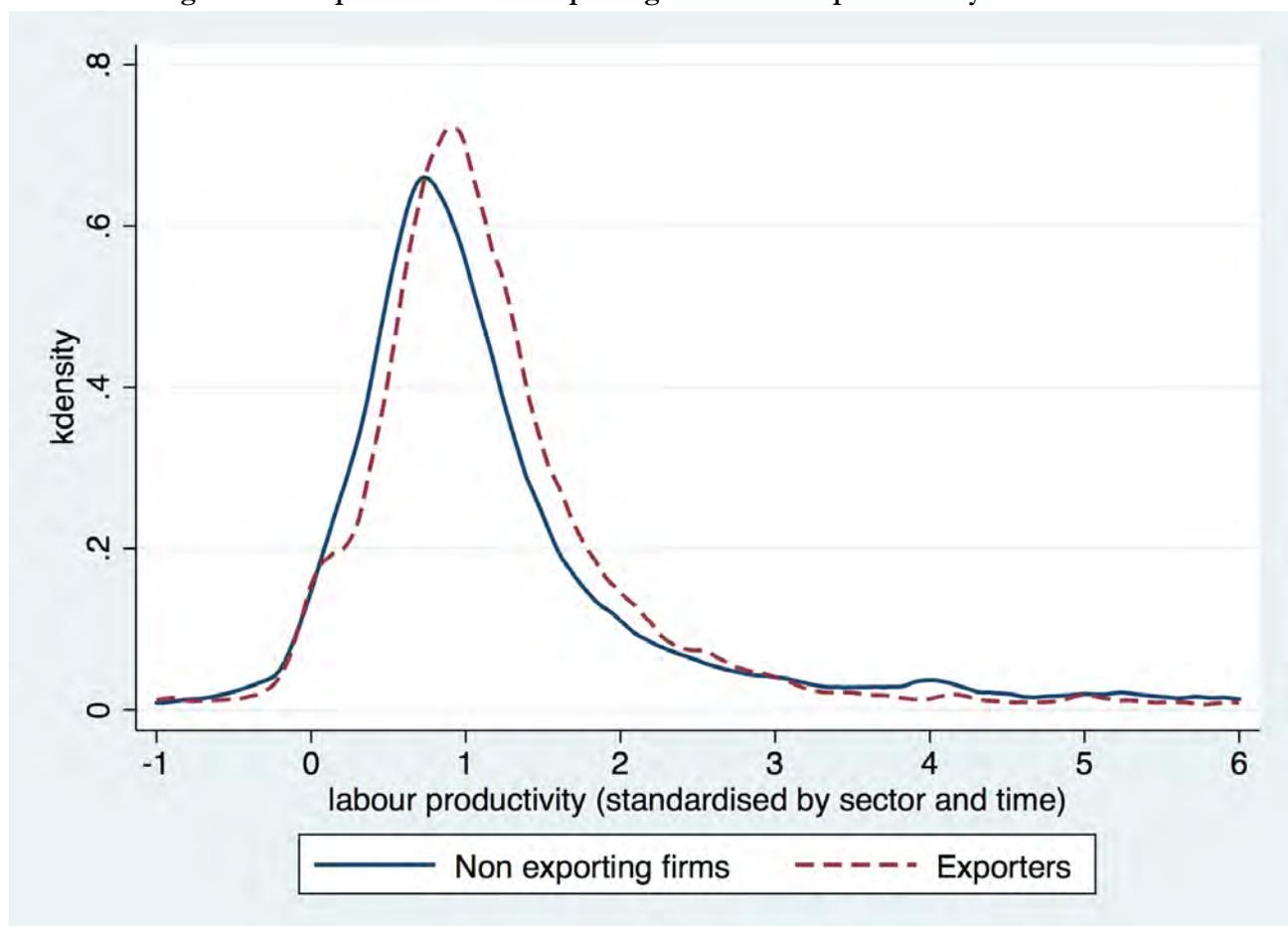
Finally, business organisations reaching international markets are also associated with a greater amount of human capital operating within their boundaries. As a matter of fact, starting from small sizes²⁴, exporters exhibit higher shares of workers with a tertiary education degree than domestic companies (Table C.4). As such, by assuming highly qualified human capital is strictly connected with higher technological and organisational capabilities, descriptive statistics suggest that firms selling products abroad are likely to be more effective in coping with fast-changing environments than non-exporting firms (Teece and Pisano, 1994).

²⁴ Among micro-firms, exporters and non-exporting firms show the same median share of employees with tertiary education. While this fact underlines a sort of similarity between these two groups, it is also worth pointing out that the index under analysis behaves very much like a step function for this class of firms, given the limited number of values (support) the variable size can undertake.

At the same time, the presence of highly educated workers increases the cost of labour units. Irrespectively of the size class under consideration, exporters are burdened with higher labour costs per employee than domestic business activities. Furthermore, starting from small companies, the median value of the distribution of unit labour costs associated with the exporters of a particular size class overcomes the median value of the distribution of unit labour costs associated with the group of domestic firms falling within the subsequent class. Hence, companies trading on foreign markets are able to take on highly competitive environments even by paying labour services more than larger domestic business activities.

In general, the fact that exporters employ a greater amount of human capital and, at the same time, pay more their workers than non-exporting business activities is in line with the view emphasising the dominance of technological over cost-reducing factors in firms' external competitiveness (Dosi et al., 2015).

Figure C.5: Exporters and non-exporting firms' labour productivity distributions



Note: Data employed in this estimate refer to firms belonging to industrial sectors. The chart reports the probability density functions (pdf) for exporters and non-exporting firms' labour productivities, expressed in terms of value added per employee. Pdfs have been estimated non-parametrically via Epanechnikov kernel functions. In order to account for differences across sectors and time, data have been normalised by dividing each observation x_{ijt} by the median value x_{jt}^{med} of the corresponding productivity distribution in sector j at time t . In particular j refer to the two-digit NACE Rev.2 industrial sectors (construction excluded) whereas t refers to the years of the MET sample survey waves (2008, 2009, 2011, 2013, 2015).

Source: MET sample survey, waves from 2008 to 2015 (pooled dataset).

Along these lines, then, the technological superiority turns into a productivity advantage. Figure C.5 plots the labour productivity kernel density functions for exporters and non-exporting firms. Estimates are performed by means of the MET survey dataset (for the details of the MET survey, see section 2.3.1). In order to cope with possible differences across sectors and time, productivities have been

standardised by dividing each observation by the median value of the corresponding sector-time distribution where the reference year corresponds to one of the five MET sample survey waves (2008, 2009, 2011, 2013, and 2015).^{25, 26}

As already pointed out by the literature, both exporters and non-exporting firms' labour productivities are far from being normally distributed (see, for instance, Altomonte, Aquilante, Ottaviano, 2012). The shape of their probability density functions is indeed positively skewed with the median level located on the left-hand-side of the average one. To this extent, the majority of business activities lie below the average value while there are few companies producing exceptionally high levels of value added per employee.

At the same time, in line with what found by many works framed in different approaches, companies able to sell their products on foreign markets tend to be more productive than the other ones. As a matter of fact, the bulk of the distribution of the former is shifted rightward with respect to the bulk of the distribution referred to the latter. In particular, the exporters' probability density function outstrips the domestic companies' one in-between the values 1 and 3 of the scaled labour productivity. As value 1 corresponds to the median of each sector-time productivity distribution, this result implies that companies reaching foreign markets are more likely than domestic business activities to exhibit 'above-the-median' productivity levels.

It is also interesting to notice the presence of a very small group of highly productive non-exporting firms. In fact, at the furthest right-hand side of the figure, the kernel density function associated with domestically-oriented activities partially overlaps and partially overcomes the exporters' one. Whilst the reasons underpinning this outcome may be manifold -ranging from market niches through to rent positions-, this evidence does not affect the general result that companies reaching foreign markets tend to be more productive than those remaining within the national borders.²⁷

Furthermore, as in the case of employees' differentials, the general result holds even when the comparison is performed within each size class separately. In Figure C.6, the four charts report the main percentiles of exporters and domestic companies' distributions of labour productivity drawn from the ISTAT database. In line with what observed in Figure C.5, the bars associated with business activities reaching foreign markets are persistently taller than those referred to the other firms.

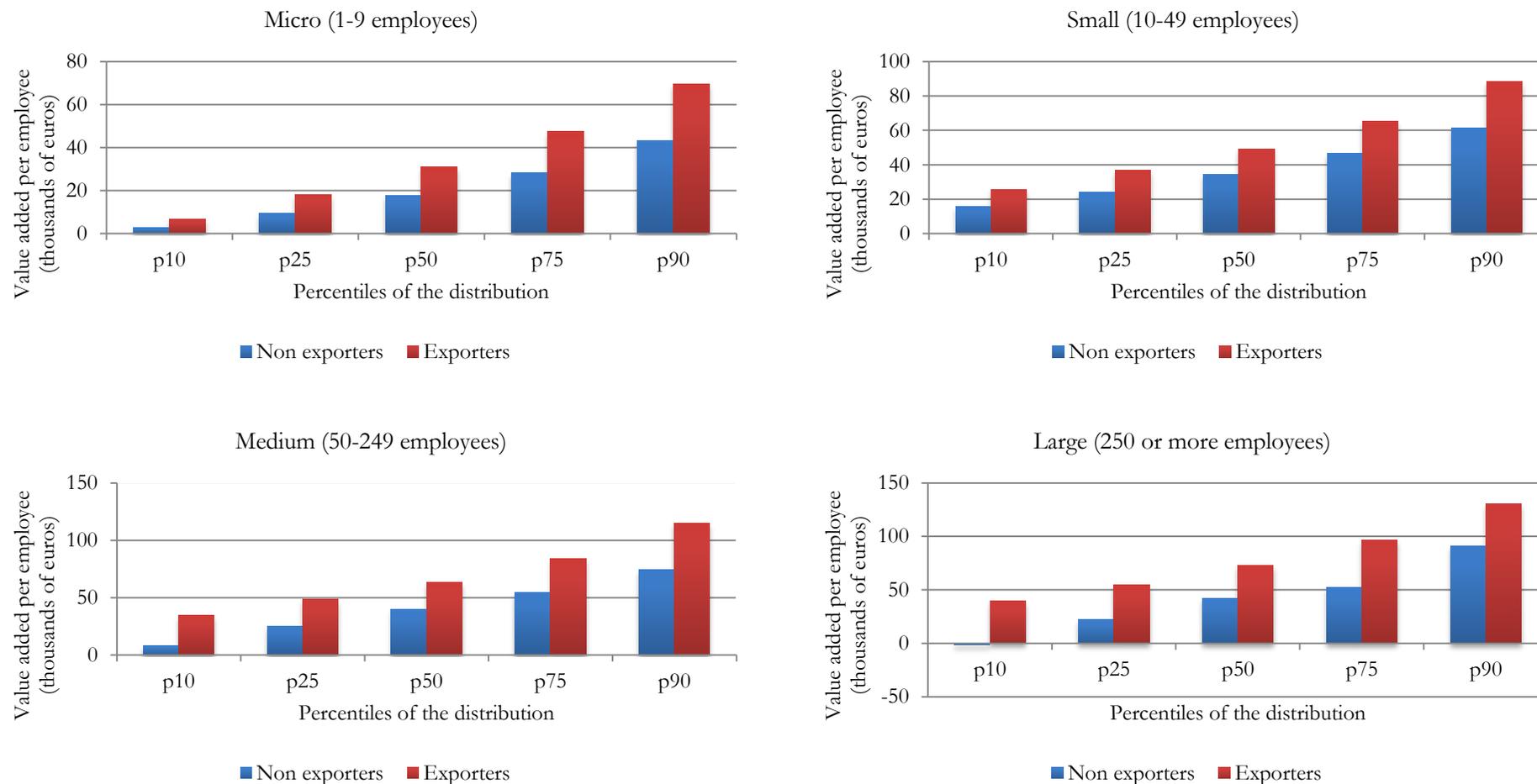
However, this correlation seems to be connected only partially with the one linking the ability to export and firm size. In fact, starting from small firms, the percentiles associated with the group of exporters exceed those associated with the group of non-exporting firms belonging to the subsequent class. To this extent, small exporters exhibit higher labour productivities than medium-size domestic companies and medium-sized exporters turn out to be more productive than large domestic enterprises.

25 As in the rest of the document, sectors refer to the NACE Rev. classification at two digits.

26 Each one of these distributions pool together exporters and non-exporting firms belonging to the same sector. To this extent it is possible to make a comparison between exporters and non-exporting firms' positioning along the same productivity scale.

27 Notice that non-exporters' probability density function overtakes exporters' one around value 3. As value 1 represents the median of the overall distribution this means that the overtaking refers to productivities 3 times larger than the median.

Figure C.6: Labour productivity distribution within size classes (percentiles)

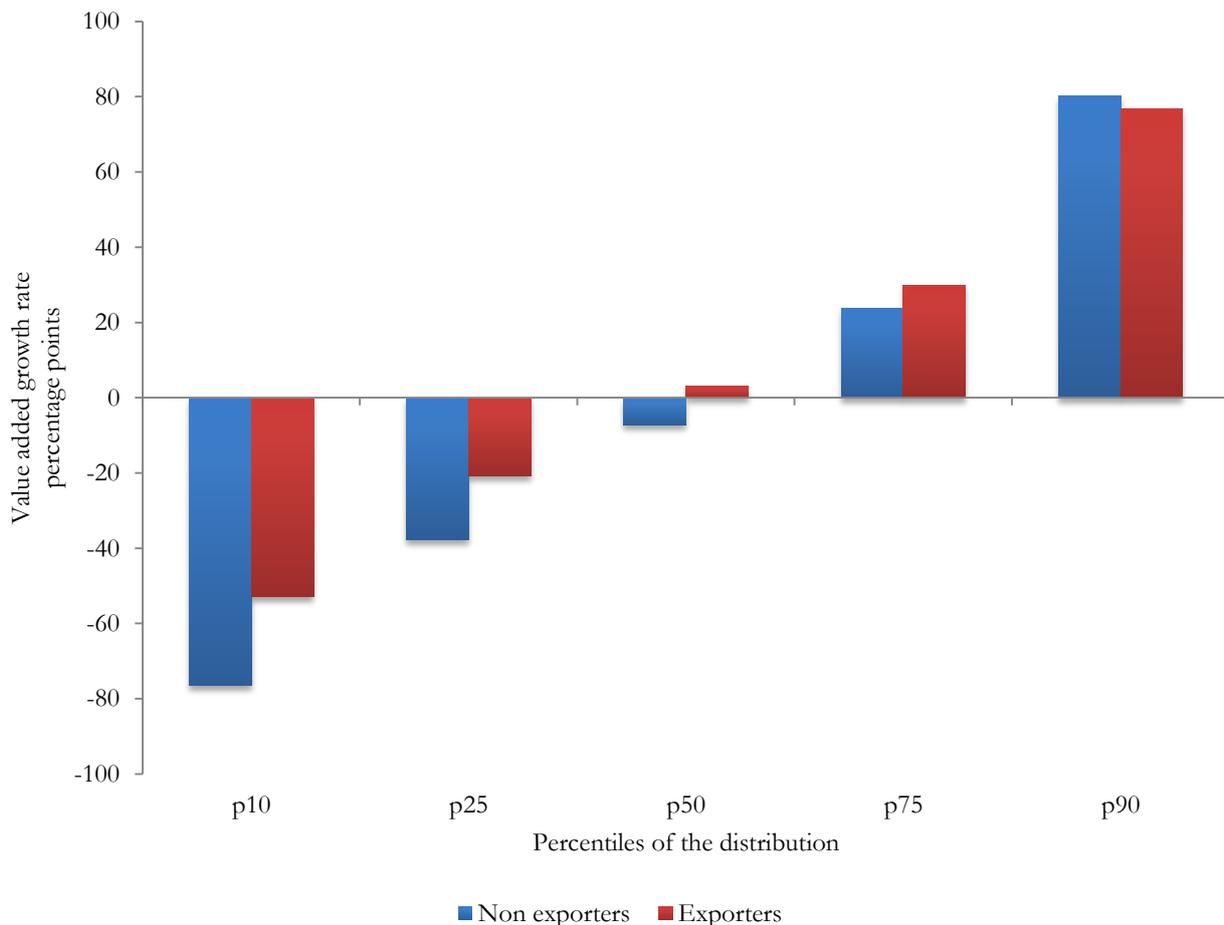


Note: Data refer to the population of manufacturing sectors in 2014.
 Source: elaborations on microdata from the Italian National Institute of Statistics (ISTAT).

Once more this evidence is in line with the idea that external competitiveness is strictly connected with organisational and technological resources and capabilities and that these ones, in return, are connected with the number of employees only in relative terms: i.e. whilst the smaller the organisation the higher the difficulties it has to cope with to survive abroad, a firm does not need to be large to be highly competitive.

When moving from characteristics to performances, the differences between exporters and non-exporting firms translate into better economic outcomes (at least until a certain threshold). By comparing the main percentiles of their distributions of value added growth rates between 2011 and 2014, it emerges that companies selling products outside national borders have been growing faster -or have been shrinking more slowly- than domestically-oriented business activities (Figure C.7). Hence, during the second phase of the crisis, the ‘exporter’ status resulted in better economic outcomes. This is also a consequence of the diverging trends followed by domestic and foreign demands described in previous pages. Indeed, by confronting a dwindling demand, the great majority of business activities that did not seize upon the opportunities offered by international markets were forced to ‘swim with the tide’, struggling more and more to maintain their turnover levels.

Figure C.7: Firms performance over the second phase of the crisis: the 2011-2014 value added growth rates



Note: Data refer to the population of manufacturing firms active throughout the 2011-2014 period.
 Source: elaborations on microdata from the Italian National Institute of Statistics (ISTAT).

Despite these differences, it is worth highlighting the exceptionally high growth rates reached by firms lying at the end of the right-hand-tail of both distributions. Indeed, during a period characterised by a harsh level of competition on the international environment and a stagnant aggregate demand on the domestic market, the 90th percentiles reported in Figure C.7 outstrip +75%. In other words, both among exporters and among non-exporting firms it is possible to detect a small but significant share of high-growth companies whose value added grew over and above +70%.

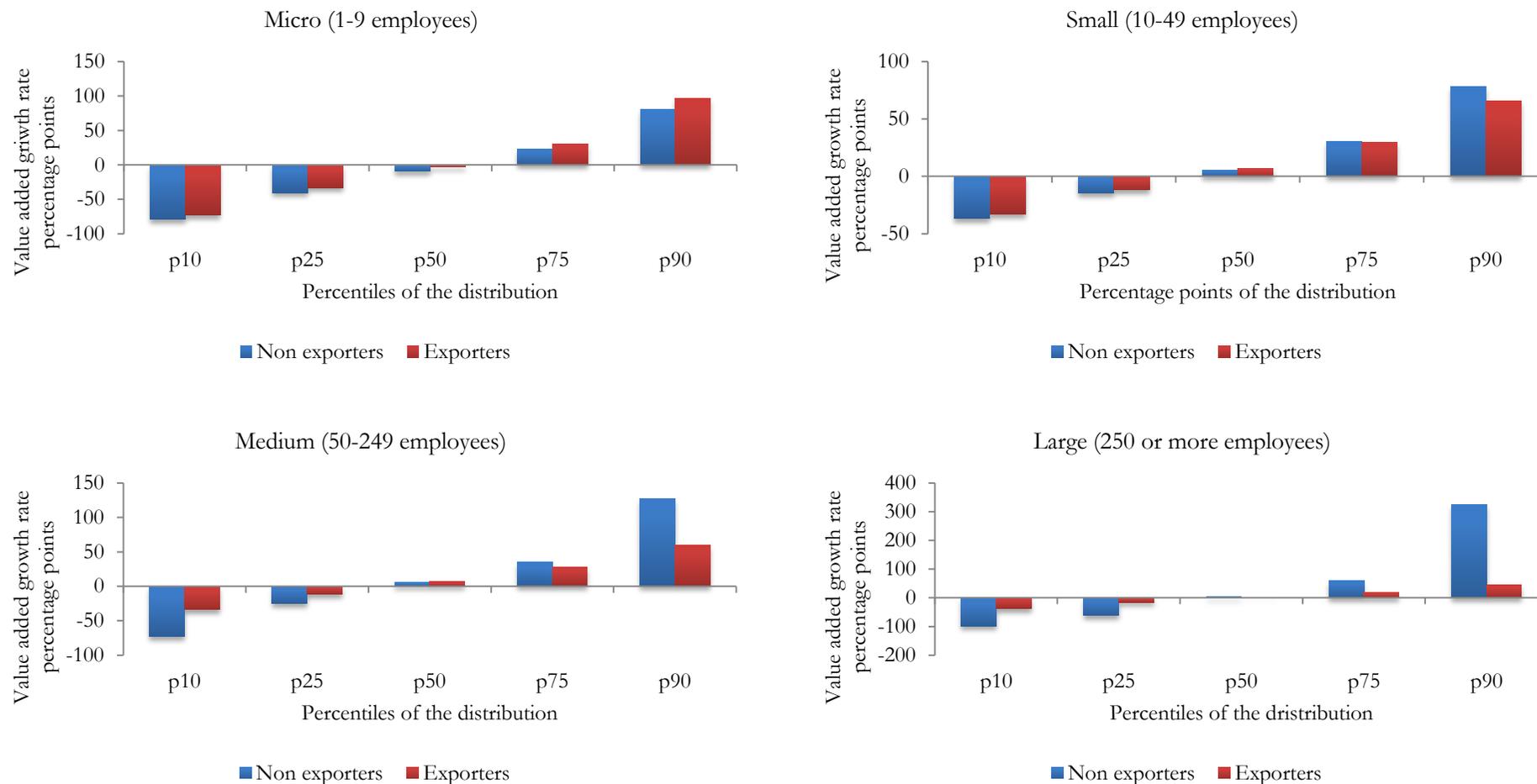
Moreover, Figure C.7 also shows that exporters' superiority is dampened in correspondence of these exceptional performances. Indeed, around the 90th percentile the comparison reveals that domestic firms outpaced the most successful exporters.

When the analysis is broken down into size classes, ISTAT data reveal two further interesting results. First of all, high-growth firms are present within each size class, micro-firms included. To be more precise, the aggregate distributions represented in Figure C.7 (and especially the one associated to non-exporting businesses) turn out to be almost identical to the ones bounded to micro-firms in Figure C.8. Hence the presence of highly performing domestic companies is not strictly connected to a specific range of employees. This evidence, even without being directly linked to external competitiveness, is extremely interesting to understand the performances of the Italian industrial system. To this extent, a dedicated Box in the next pages provides some further hints on the characteristics of these firms.

The second interesting result shown in Figure C.8 is that the superiority of high-growth non-exporting businesses with respect to high-growth exporters is circumscribed to firms with more than 9 employees. As a matter of fact, among micro-firms, exporters outmatched non-exporters along the entire value added growth distribution (Figure C.8). On top of that, the graphs also highlight that the gap between high-growth domestically-oriented and exporting business activities widens across size-classes. For example, the difference in percentage points between medium-sized high-growth non-exporting and exporting companies is smaller than the same difference computed for large enterprises.²⁸ This is true also for the opposite phenomenon at the beginning of the distributions, where exporters dominates non-exporting firms: in fact, the differences (in absolute value) between the two groups of poorly performing business activities increase along with the size class taken in consideration.

²⁸ A similar result is detected between small and medium firms.

Figure C.8: Distribution of value added growth rates within each size class

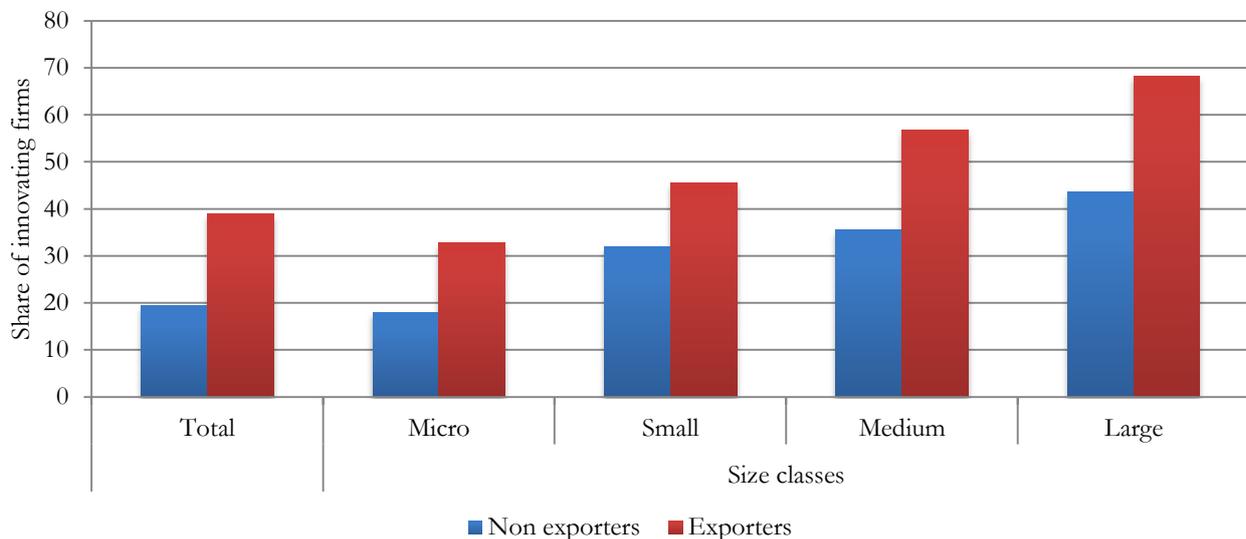


Note: Data refer to the population of manufacturing firms active throughout the 2011-2014 period.
 Source: elaborations on microdata from the Italian National Institute of Statistics (ISTAT).

All the differences between exporters and domestically-oriented firms hitherto analysed are associated either with their characteristics or with their performances. However, while both characteristics and performances denote the outcome of some process, they do not explain the process itself. To this extent, in order to identify the drivers of competitiveness, the analysis must focus on those factors triggering a change in competitive advantages.

As emphasised by the evolutionary literature on industrial dynamics, technological and organisational innovations play a central role in this matter for they represent the way through which business organisations seek to gain an advantage over their competitors (Dosi and Nelson, 2010). In this way, they represent a key element for external competitiveness (Dosi et al., 2015) as well as an indirect signal for the presence of dynamic capabilities, i.e. of those organisational abilities of coordinating internal and external resources to promptly deal with the changing surrounding environment (Teece and Pisano, 1994).

Figure C.9: Presence of innovators among exporters and non-exporting firms: share of firms within industrial sectors



Note: Data refer to firms belonging to industrial sectors. ‘Innovators’ include all the business activities that stated of having introduced at least one type of innovation during the period of reference of the MET questionnaire. Types of innovation encompass: new products, new processes, new organisational, marketing and managerial practices.

Source: MET sample survey, waves from 2008 to 2015 (pooled dataset).

Likewise competitiveness, though, the innovative process is a multifaceted and complex phenomenon that can be studied from different perspectives, each one characterised by strengths and drawbacks (for a discussion of many innovation indicators see for example Smith, 2004 and Castellani and Koch, 2015). Thanks to the information contained in the MET database, the analyses in this document focus both on innovation output and on innovation input variables, the former referring to the final outcome of the process while the latter to the factors involved in its ‘production’. The possibility of taking advantage of both types is very important for it allows to draw a thorough picture of the technological advancements of the Italian firms and, hence, of their level of competitiveness.

Figure C.9 reports the information about the diffusion of innovators among exporters and domestically-oriented companies both at the aggregate and at the size-class levels. Data are drawn from the pooled MET dataset and refer to the entire time span of the crisis 2008-2015. The height of the bars represents the share of business activities that have introduced at least one type of innovation (either technological or organisational) during the period of reference of each survey wave.

In line with many evidences (Bernard and Jensen, 2004; Wagner, 2007; Dosi et al. 2015), export and innovation activities appear to be strongly positively correlated. Indeed, the share of innovators among

the firms selling (part of) their products on foreign markets doubles the one detected among the domestically-oriented business activities (39 % against 19 %). This association holds even within each size class and seems to be particularly strong for micro-organisations. The percentage of innovators among the exporters belonging to this group is almost twice as much as the one detected among non-exporting micro-firms (33 % against 18 %).

Moreover, similarly to what found for productivity, the innovation-export nexus seems to be only partly linked to the number of employees. As a matter of fact, despite the presence of innovators increases along with size, the share of innovating exporters within a class outstrips the share non-exporting innovators within the subsequent class. For example: small exporters tend to innovate more frequently than medium-sized domestically-oriented firms (45 % versus 35 %). As before, then, size is important in relative terms. Although smaller organisations struggle more than larger ones to access and manage the resources and capabilities necessary to carry out innovative activities, innovations do not require a very large number of employees to be accomplished.

Table C.6: Types of innovators among firms within industrial sectors

	Firms introducing new products		Firms introducing new processes		Firms introducing new organisational/managerial/marketing practices	
	Non exporters	Exporters	Non exporters	Exporters	Non exporters	Exporters
	%	%	%	%	%	%
Micro	11.8	24.6	7.60	15.2	7.40	13.4
Small	18.6	33.6	16.9	24.5	16.3	22.6
Medium	20.0	43.0	18.1	33.1	21.9	31.1
Large	17.2	55.8	26.1	44.7	30.4	41.5
Total	12.6	29.2	8.60	19.8	8.40	17.9

Note: Data refer to firms belonging to industrial sectors. The types of innovation introduced are not mutually exclusively, i.e. a firm may have introduced a new product, a new process and a new set of organisational, managerial and marketing practices at the same time.

Source: MET sample survey, waves from 2008 to 2015 (pooled dataset).

Table C.5 digs further into the export-innovation relationship by reporting the share of business activities per each type of innovation introduced. In particular the analysis accounts for the introduction of new products, new processes, and new organisational/managerial/marketing practices²⁹. Overall, exporters' higher propensity to innovate does not appear to be bound to a specific variety but it is equally detectable in each single category. As such, companies that sell (part of) their products abroad turn out to be more inclined than the other ones to undertake all the types of technological and organisational changes.

Provided that, it is however worth pointing out that product innovations are the most frequent type of innovation introduced both by exporters and by domestic firms while process and organisational/managerial/marketing innovations lag behind.

29 In the MET questionnaire the organisational, managerial and marketing innovations are grouped together. Although these categories refer to different aspects of firm's organisation, they represent three types of innovation that, at least in principle, do not require any investment to be carried out. Under this perspective, then, they can be treated as three similar phenomena.

On top of that, the widest gap (in percentage points) between the two groups of companies occurs precisely in correspondence of product innovations. Whilst this outcome follows from a multitude of phenomena, it nevertheless highlights the fact that the introduction of new varieties of goods is extremely sensitive to the demand conditions, i.e. that it is a *demand pulled* process (see for example Guarascio, Pianta, and Bogliacino, 2016). Indeed, as any change in the portfolio of firm's products is strictly bound to the targeted market, the large bias of product innovators for international environments represents a further sign for the difficult conditions of the domestic market.

At the same time, the strong correlation between the introduction of new products and firm's ability to export underlines the strategic importance of this type of innovative activities for entering and surviving fast-changing environments. In this respect the literature has emphasised that the production of new varieties is a fundamental way whereby business companies may reach market niches and/or obtain quasi-rents erecting barriers against their competitors (Dosi et al., 1990; Coad, 2009). On top of that, the permanence on a specific market may also help the firm to learn from the tastes and needs of its customers as well as to get in touch with new technologies, spurring the introduction of new products and, thus, reinforcing the relationship between these two phenomena (*learning by exporting*).

In terms of size classes, the data in Table C.5 show that the degree of polarisation between exporters and non-exporting firms increases along with the number of employees. For example, among small firms, the difference in the share of product innovators between exporters and domestically-oriented businesses amounts to 15 percentage points whereas, among large firms, this statistic equals 38.6 percentage points. Although this evidence may be partly driven by the difficulties that smaller firms take on to access the necessary resources to introduce new products, it is also a sign that larger firms that remained domestically-oriented are less inclined, or less able, to renew their range of goods.

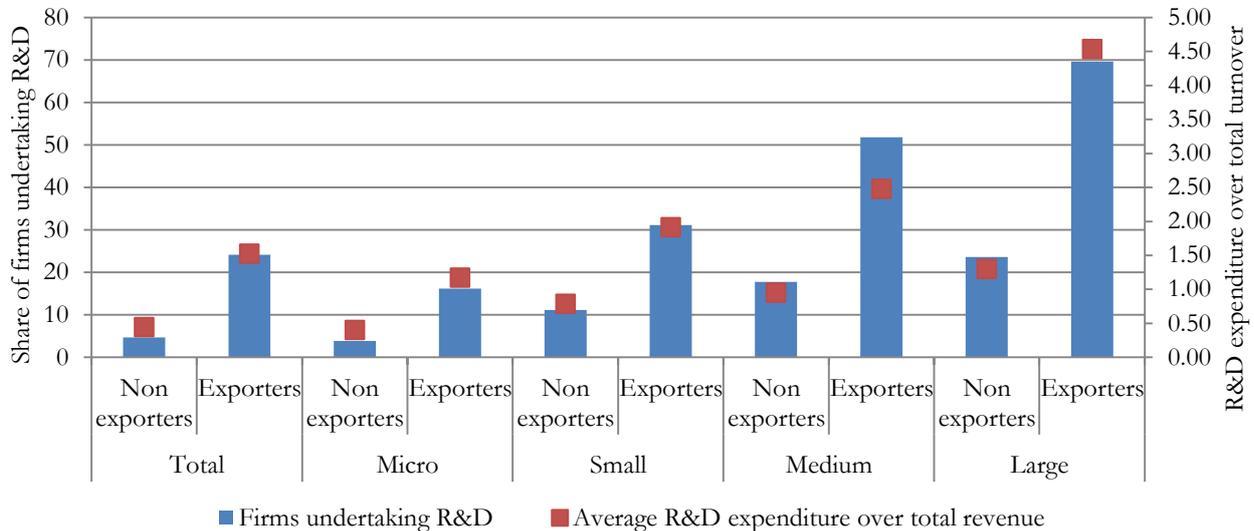
In terms of process and organisational/managerial/marketing innovations, the differences in the behaviours of exporters and non-exporting firms are less strong. Indeed, whilst the former introduce new production methods and new management practices more frequently than the latter do, the propensities to innovate of the two groups are closer than what happens in the case of product innovation. This outcome is due both to lower shares of exporters undertaking these activities as well as to higher percentages of domestic businesses changing processes and practices to cope with the fallouts of the crisis. As a matter of fact, among large and medium firms that remained on a local/national scale, the number of organisational and (to a certain degree) process innovators outstrip the number of companies that introduced new products. As such, these evidences suggest that process and organisational innovations may be employed either to compete on foreign markets or to survive within national borders.

A second perspective to study the innovation-export nexus focuses on the procedures set up by an organisation to improve its knowledge base. Indeed, the high degree of competitiveness characterising the international environments require business activities not only to renew their range of products, production processes and organisational routines, but also to manage and process a great amount of information in order to be able to create new varieties of innovations. These activities may be both formal and informal depending on whether the innovative effort translates into dedicated R&D routines, or it is carried out during other stages of the production process, as it is the case, for example, of *learning by doing* phenomena or of patent acquisitions (Nelson and Winter, 1982). Whilst both types play an important role for firm's technological advancements, codified R&D activities are often regarded as potentially more productive. Moreover, as already mentioned in the background scenario, the lack of a sufficient level of effort devoted to these procedures has been often pointed out as one of the major weakness of the Italian industrial system.

To this extent, Figure C.10 reports the MET estimates on the diffusion of R&D among exporters and non-exporting firms and on the amount of resources invested in these projects by these two groups. In particular, the height of the blue bars indicate the percentage of business activities that carried out a research and development operation during the reference period of the corresponding MET wave, whereas the red squares indicate the average R&D expenditure, expressed in terms of firm's total

turnover, during the year the survey was conducted³⁰. The data are drawn from the pooled MET dataset in order to embrace the entire span of the crisis (2008-2015), and the information reported in the chart is detailed by size class.

Figure C.10: R&D activities among exporters and non-exporting firms by size class



Note: Data refer to firms belonging to industrial sectors. The graph reports the diffusion of R&D activities and the effort in terms of R&D expenditure over total turnover among manufacturing firms broken down by size class and export status. Blue bars represent the share of business activities undertaking research and development activities (left axis), whereas red squares indicate the average weight of R&D expenditure on total revenue (right axis).

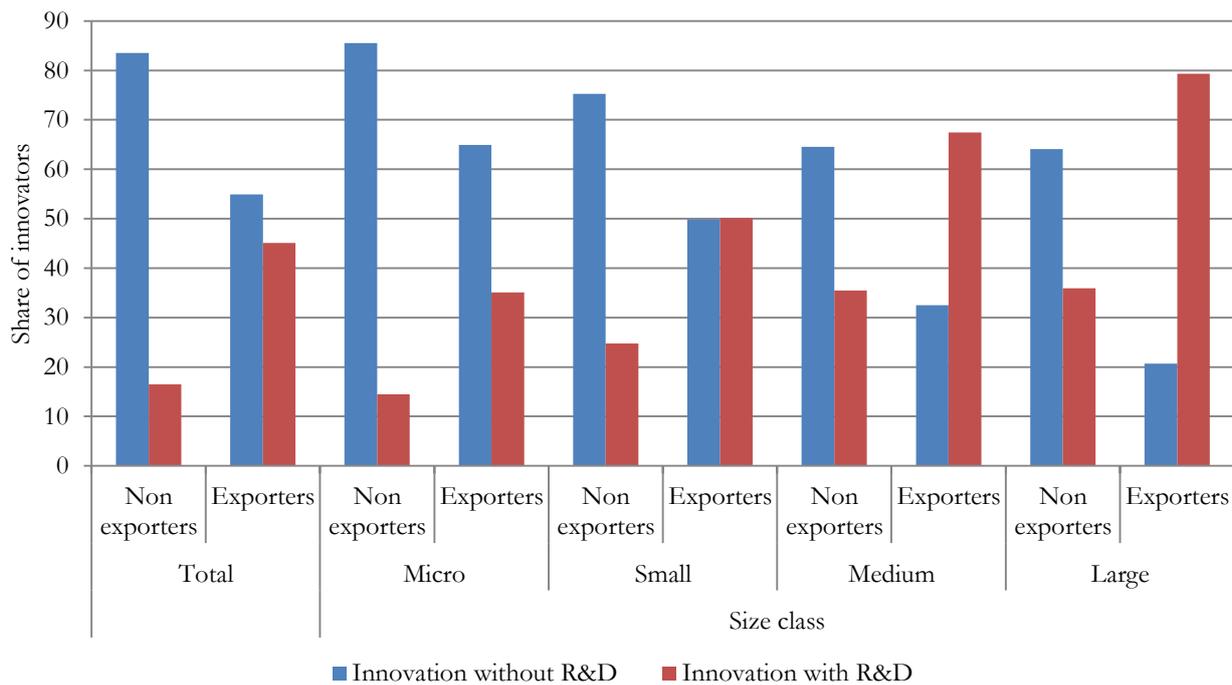
Source: MET sample survey, waves from 2008 to 2015 (pooled dataset).

As for the innovation output variables, the ability of reaching foreign markets and the tendency of investing in research and development activities are strongly positively correlated. As a matter of fact the percentage of exporters engaged in R&D activities is five times greater than the one referred to the domestically oriented businesses (24 % versus 5 %). The propensity of exporters of being more frequently active in R&D projects holds even within each size class, even though the extent of this difference increases along with the number of employees. In line with what observed before, this evidence may be the result of two different dynamics. On the one hand, smaller exporters face higher difficulties in undertaking research and development activities due to the high costs they entail and, thus, many of them may fail to start these projects. On the other hand, among non-exporting companies, the incentive to devote resources to these operations does not increase with size as fast as among their exporting counterparts. As a result, despite the relatively large size, many domestic companies do not undertake formal R&D activities. Once more the explanations for this evidence are manifold, ranging from the drop of the domestic aggregate demand to the lack of the necessary resources to start a new research activity.

In accordance with these interpretations, the ability to carry out research projects seems to be only partially related to the size of the organisation. In fact, the share of exporters engaged in R&D within each class outstrips not only the corresponding share of non-exporting companies, but also the one referred to the group of domestic firms falling within the subsequent class. For example: small exporters carry out R&D activities more frequently than small and medium domestic firms (31 %, 11 % and 18 % respectively).

³⁰ Non-exporting firms are included in the calculus of the average R&D expenditure by imposing them a zero value.

Figure C.11: Types of innovators among exporters and domestically-oriented firms



Note: Data refer to firms belonging to industrial sectors. ‘Innovators’ include all the business activities that stated of having introduced at least one type of innovation during the period of reference of the MET questionnaire. Types of innovation encompass: new products, new processes, new organisational, marketing and managerial practices.
 Source: MET sample survey, waves from 2008 to 2015 (pooled dataset).

Similar results can be detected when focusing on the amount of resources devoted to the research activities rather than to their diffusion. Indeed, on average, business companies that sell (part of) their products on foreign markets invest a greater share of their revenues in R&D projects than non-exporting firms (1.52 % versus 0.44 %). In line with the evolutionary perspective (Dosi et al., 2015), then, highly competitive organisations are associated with higher efforts to win the technological competition on international markets. Moreover, this evidence holds true not only within each size class, but also between each group of exporters and the group of non-exporting firms falling within the subsequent class.

As a proof for the key role played by R&D within the innovative process, Figure C.11 breaks down exporting and non-exporting innovators by the types of innovative activities they carry out. In particular, blue bars represent the share of innovating activities that introduced an innovation without being engaged in any research project while red histograms represent the share of innovators involved in R&D³¹. In line with the evidences provided in previous pages, exporters tend to sustain their innovation by means of codified research activities more frequently than domestically oriented businesses do. This is in line with the idea that the larger number of employees mirror more complex organisational structures. Nevertheless, as before, size has to be interpreted in relative terms, for the share of exporting innovators with R&D within each category is greater than the share of the domestically oriented innovators falling within the subsequent class. As such, exporters are not only more structurally complex, but their structure is also organised more efficiently.

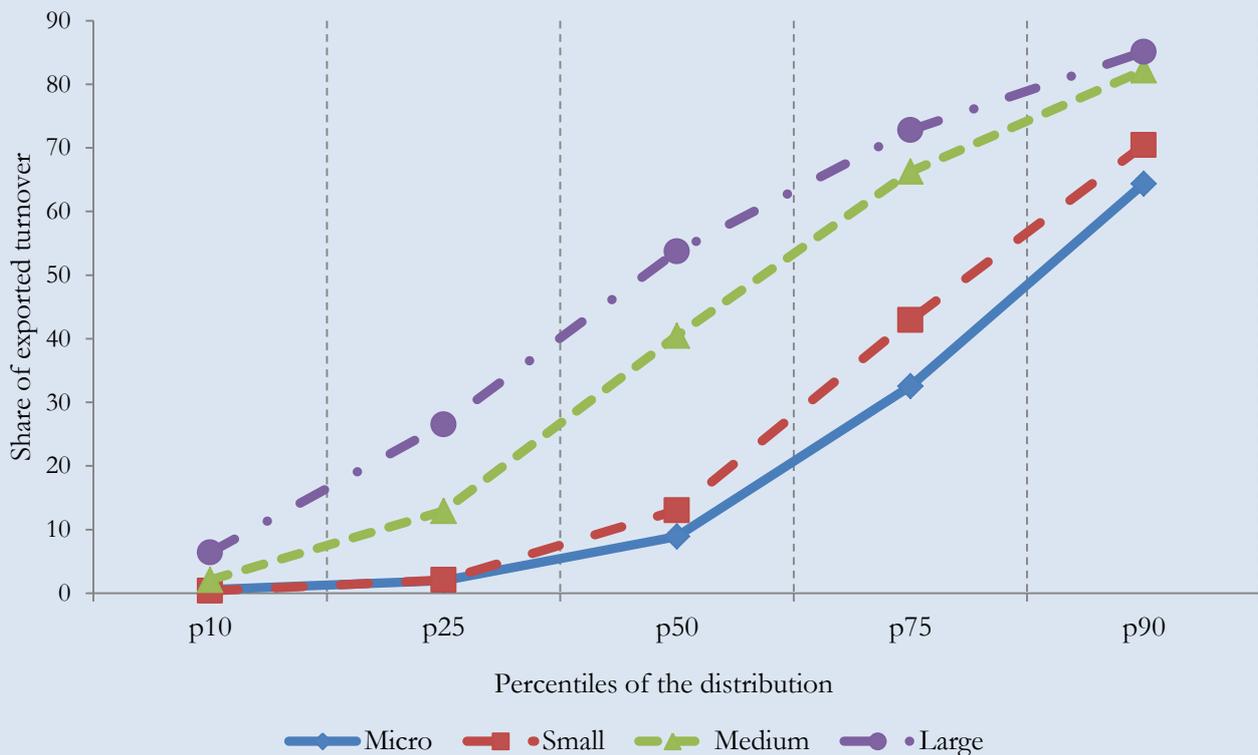
³¹ The shares sum to 100.

Box 2: Micro-sized exporting firms

The data on the population of exporting firms reported in Table C.3 revealed the presence of a significant share of micro-sized business activities selling products on international markets. As already mentioned, this evidence neither represents a peculiar feature of the Italian productive system nor is at odds with the general evidence that exporters tend to be larger than domestically oriented business activities (Figure C.4).

Nevertheless, the descriptive statistics provided so far also suggest that firms able to reach foreign markets are characterised by complex organisational structures. As such, the narrow range of very small sizes embraced by the category of micro-firms does not seem to be compatible with these types of organisational arrangements, calling for an in-depth analysis of the characteristics of this group of companies.

Figure C.12: Distribution of export intensive margins within each size class



Note: Data refer to the population of manufacturing firms. Intensive margins are computed as the share of total turnover stemming from export activities.

Source: elaborations on microdata from the Italian National Institute of Statistics (ISTAT).

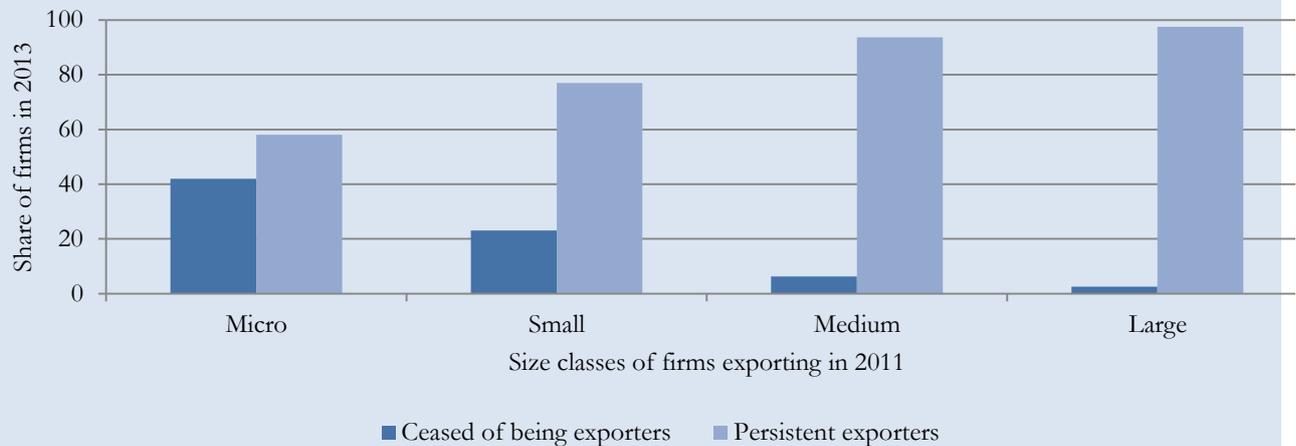
To begin with, whilst able to join international markets, smaller firms remain more grounded in the domestic market than their larger counterparts. Indeed, the comparison across size classes of the main percentiles of the ‘export intensive margins’³² distribution (Figure C.12) shows that small and micro business activities fall significantly back medium and large companies starting from the 25th percentile until the 75th one (included). In particular, the median values for small and micro-firms amount to 13 % and 9 % respectively, whereas for medium and large firms reach 40 % and 54 %. This means that many small and micro-sized exporters are ‘marginal exporters’ with more than 85 % of total turnover coming from domestic markets.

The lower degree of dependence on the foreign environment is coupled with a lower ability of exporting persistently through time. Figure C.13 plots, by size class, the share of firms that ceased their

³² ‘Export intensive margins’ are computed as the share of total turnover stemming from export activities.

export activity between 2011 and 2013 together with the share of companies that kept on exporting over the same period. According to these histograms micro-firms faced the highest difficulties with more than 40 % of organisations that failed to continue to sell products abroad until 2013.

Figure C.13: Degree of persistency of export activities: the 2013 export status of the 2011 exporters

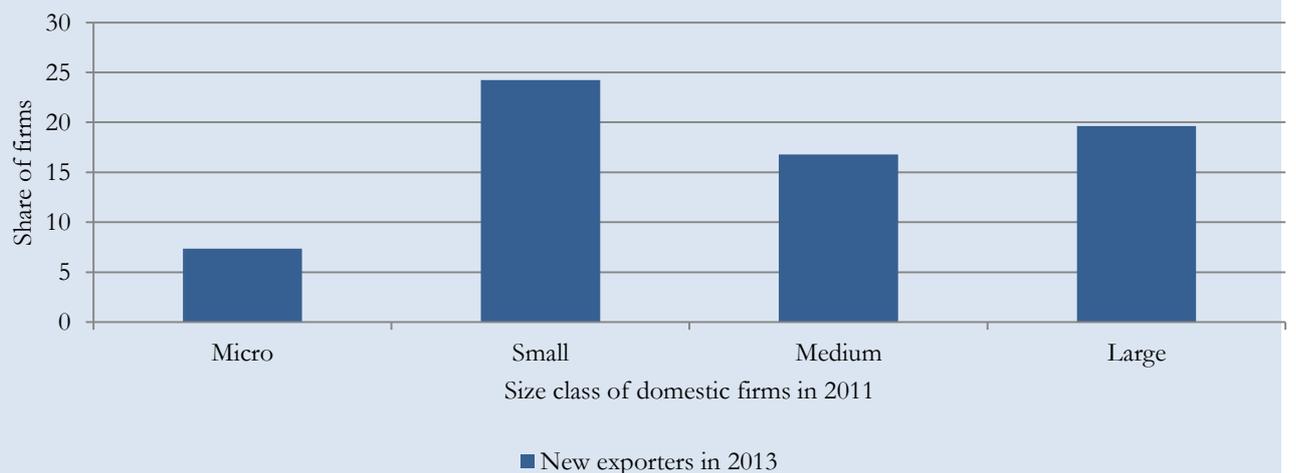


Note: The chart refers to industrial firms that exported in 2011 and survived over the 2011-2013 period. Within each size class, the bars break the 2011 exporters down according to their behaviour in 2013.

Source: MET sample survey, panel 2011-2013.

At the same time, the sunk costs associated with the internationalisation process (Melitz, 2003) held many domestically oriented micro-sized businesses back from starting an export activity. Indeed, as shown in Figure C.14, the share of organisations with 1 to 9 employees that overtook the national borders between 2011 and 2013 amounts to 7 %, whereas among small, medium and large companies this statistic reaches 24 %, 17 % and 20 % respectively.

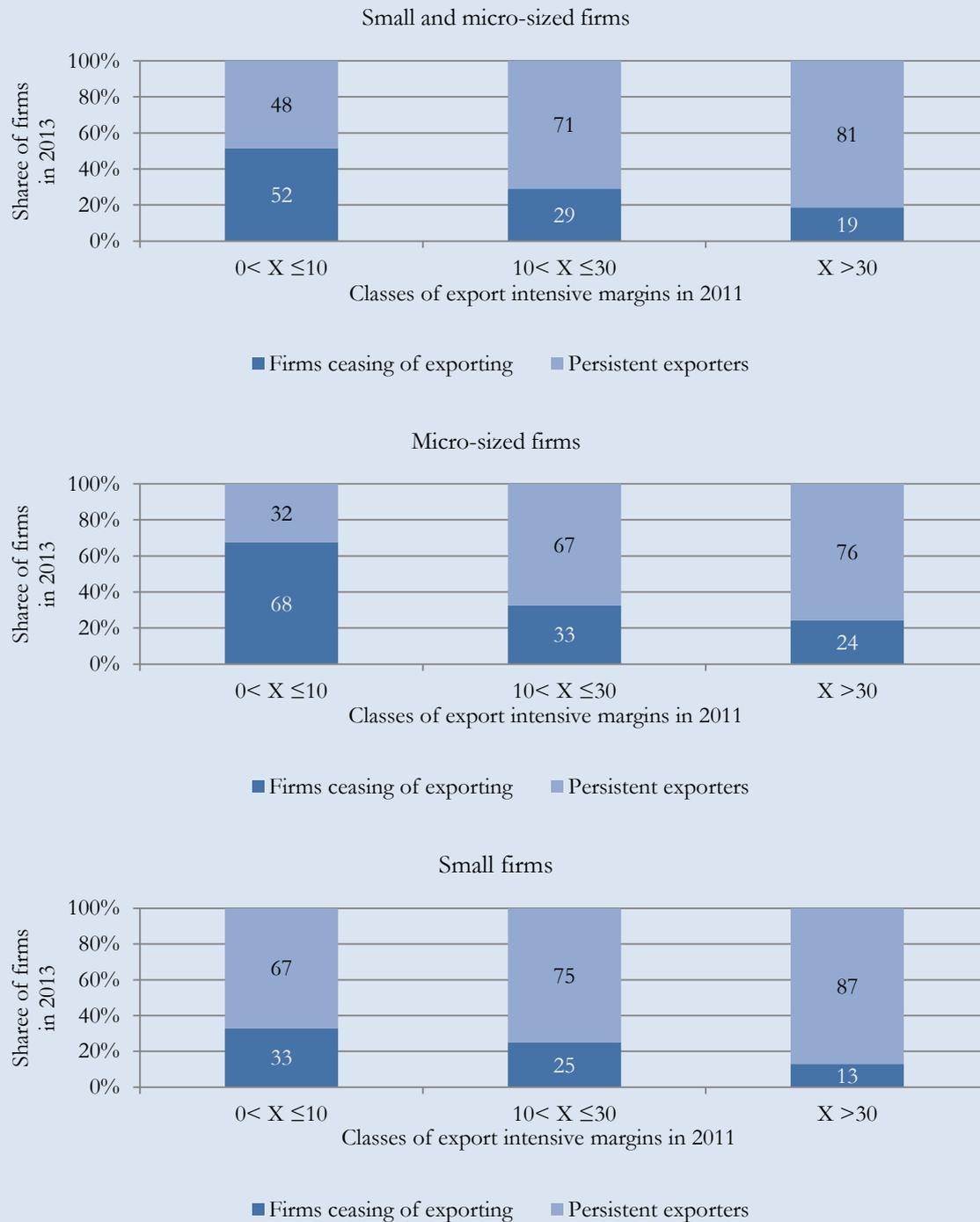
Figure C.14: Share of firms starting to export during the period 2011-2013



Note: The chart refers to industrial firms that started to export over the 2011-2013 period..

Source: MET sample survey, panel 2011-2013.

Figure C.15: Persistency of export activities (in terms of the share of exported turnover) over the period 2011-2013



Note: The chart refers to firms that exported in 2011 and survived over the 2011-2013 period. On the x axis firms are grouped into 3 categories in accordance with their export intensive margins in 2011 (i.e. the share of total turnover obtained on foreign markets). The first category, labelled '0 < X ≤ 10', refers to exporters with a share of exported turnover in-between 0 and 10% (with the upper bound included in the range). The second one, '10 < X ≤ 30', includes all those business activities that obtained 10 to 30% of their total revenue on foreign markets. Finally, the last group, 'X > 30', gathers all the firms with a percentage of sales on foreign markets outstripping 30%. On the y axis, we reported the distribution of the three groups in terms of export statuses in 2013.
 Source: MET sample survey, panel 2011-2013.

Table C.7: Characteristics of firms according to the degree of persistency of export activities

	ALL FIRMS				MICRO FIRMS ONLY			
	Average values		Median Values		Average values		Median Values	
	Occasional exporters	Persistent exporters						
Employees	8	41	2	12	3	4	2	2
Age	21	27	18	26	16	20	12	17
Leverage *	2.50	2.70	0.89	0.89	1.87	2.26	0.89	1.14
ROS *	-3.45	-0.55	0.86	1.05	-15.66	-2.06	-0.35	1.05
Turnover growth rate *	-1.58	-1.24	-1.15	0.41	-4.24	-4.58	-3.63	-0.17
Share of exported turnover **	22	37	10	30	20	37	10	30
Group ***	5%	14%	-	-	3%	3%	-	-
Innovation ***	23%	39%	-	-	24%	31%	-	-
Product innovation ***	15%	29%	-	-	15%	26%	-	-
Process Innovation ***	8%	20%	-	-	8%	12%	-	-
Organisational, managerial or marketing innovations ***	11%	15%	-	-	13%	8%	-	-
R&D ***	12%	30%	-	-	11%	15%	-	-
R&D intensive margin [†]	0.88	1.09	0	0	1.13	0.38	0	0
External R&D ^{††}	23%	34%	-	-	14%	29%	-	-

Note: Data refer to industrial firms that exported in 2011 and survived over the 2011-2013 period. Business activities have been grouped according to the pattern followed by their export statuses during this period of time. Firms that ceased of being exporters either in 2012 or in 2013 are labelled 'Occasional exporters', whilst firms that have sold their products/services on foreign markets throughout all these years are labelled 'Persistent exporters'.

* The variable has been standardised by sector and time: each observation has been divided by the median value of the sector-specific distribution in the reference year.

** The values refer to the wave 2011.

*** Share of firms

[†] R&D expenditure over total sales

^{††} Share of firms engaged in R&D

Source: MET sample survey, panel 2011-2013.

Overall, the persistency of the export activity and the degree of penetration of foreign markets are two strictly connected phenomena. As a further proof, Figure C.15 divides small and micro-firms that exported in 2011 into three groups -identified on the basis of export intensive margins- and breaks small and micro companies that survived over the years 2011-2013 down into persistent and occasional exporters.

In all the three panels of this figure, the presence of businesses that ceased their export activities decreases along with higher levels of initial export intensive margins. This evidence suggests that the more a firm has become internationalised, the less likely it will regress to a domestic scale in the near future. Moreover, it is worth pointing out that the widest difference between small and micro-firms occurs in correspondence of the first class ($0 < X \leq 10$), where the share of persistent exporters among the former amounts to 67 %, whereas among the latter dwindles to 33 %.

However, as soon as we move towards higher degrees of dependence from international markets, the share of micro-sized organisations exporting persistently rises sharply and outstrips 65 %. To this extent, the fragility of smallest firms seems to be bound to their relative low degree of internationalisation.

At the same time, these weak export performances are placed side by side with weak structural characteristics and economic results. Indeed, according to the evidences provided in Table C.6, businesses that failed to continue their export activity not only tend to be smaller and younger than those persistently active on international markets, but they also show lower degrees of profitability and lower turnover growth rates.

All these evidences are coupled with a lower tendency towards innovation and technological changes. As a matter of fact, occasional exporters tend to innovate less frequently than persistent exporters. In general, this result holds even when the analysis focuses on each type of innovative output separately. A partial exception, however, is found among micro-firms, where occasional exporters tend to adopt new organisational/managerial/marketing practices more frequently than persistent exporters. Yet, as already mentioned in previous pages, this type of innovations does not require high levels of technological knowledge to be carried out and may be employed to reorganise the structure of the company to survive on the domestic market. As such, the relatively higher tendency towards organisational innovations does not necessarily denote a higher propensity towards cutting-edge technologies.

Furthermore, the fragility of occasional exporters (included those with less than 10 employees) in technological terms is not restricted to the innovations introduced, but it also embraces R&D activities. As a matter of fact, occasional exporters tend to engage research projects less frequently than persistent exporters; and when they do, they are more likely to undertake R&D entirely by themselves (i.e. without resorting to external collaborations).

All these evidences, then, suggest that one possible explanation for the fragility of (smallest) companies that failed to continue to sell products abroad relates to their lower ability in managing and processing a sufficient amount of technological knowledge that would allow them to reach higher levels of external competitiveness.

Box 3: High growth non exporting firms

The analysis of the distribution of the value added growth by export status revealed the presence of high-growth domestic firms, i.e. of business activities that exhibited extraordinary performances over the period 2011-2014 (see Figures C.5 and C.6). Even though this evidence may be the result of different phenomena, it is nevertheless interesting to analyse the main features of high growth companies in order to be able to pinpoint the factors differentiating them from the remaining non-exporting firms.

To this extent Table C.7 reports some relevant characteristics to compare ‘high-growth’ firms (with a VA growth rate greater than the 90th percentile) with ‘normal’ companies (i.e. the remaining ones).

In particular, the first two columns refer to the group of businesses that sold their products only on national markets over the period 2011-2013, whereas the last two columns report the same information for persistent exporters over the same period.

Table C.8: Non exporting firms and high growth episodes between 2011 and 2014: main characteristics

	Domestic normal	Domestic high-growth	Exporters normal	Exporters high-growth
Micro sized	47%	65%	20%	14%
Young	1%	5%	3%	4%
Innovation (general)	10%	15%	33%	44%
Product innovation	5%	9%	26%	38%
Product innovation 2	3%	5%	21%	24%
Process innovation	4%	8%	14%	26%
Organisational/managerial/marketing innovations	5%	7%	13%	11%
R&D	6%	3%	33%	43%
Labour productivity (median)*	0.99	0.67	1.04	1.06
VA growth rate in t-1 (median)	4.25	2.37	2.71	5.14
VA growth rate in t-1 (p25)	-9.93	-30.89	-8.13	-9.67

Note: Data refer to industrial firms active in between 2011 and 2014. Values reported in the table are averages. The group ‘High growth’ includes all the companies with a 2011-2014 growth rate of the value added greater or equal the 90th percentile of the sector-specific distribution. Conversely, the group ‘Normal’ embraces all the business activities with a 2011-2014 growth rate of the value added smaller than the 90th percentile of the sector-specific distribution.

* The variable has been standardised by sector and time: each observation has been divided by the median value of the sector-specific distribution in the reference year.

Source: MET sample survey, panel 2011-2013.

By focusing on domestic firms, the data show that, in the starting year, high-growth firms were more often micro-sized, younger, and slightly more innovative than the other ones. As for this last point, it is worth noting that the propensity to innovate was quite low in both groups, involving less than 15% of the population of reference. Moreover, high-growth domestic firms were less engaged in R&D activities and exhibited lower productivity values.

All these interpretations should not overlook the fact that, for a significant share of domestic firms, high-growth episodes followed a deep drop in VA occurred during the previous year. As a result, in many cases, these very high growth rates have been driven by a relatively small size of VA in the starting year. On the contrary, this evidence does not find support when the focus shifts on the group of exporters.

On balance, however, these phenomena are not fully explained by previous factors. A relevant part of

the outstanding performance of domestic firms could be linked to specific market segments featuring rents, idiosyncratic demands, market niches, etc. On the contrary, when high-growth episodes are studied on the subset of persistent exporters, extraordinary performances are strongly associated with past innovative behaviours and higher levels of competitiveness.

Box 4: The characteristics of innovators

The descriptive statistics hitherto analysed suggest technological and organisational changes are fundamental strategies for a firm willing to gain high levels of external competitiveness. Before investigating further this hypothesis in the econometric framework, it is interesting to look at the characteristics of innovative firms. Indeed, by assuming the introduction of new products, processes and/or organisational practices is a key element to reach the success on foreign markets, the study of the drivers of external competitiveness necessary shifts towards the study of the factors underpinning the ability to innovate.

Table C.9: Main characteristics of innovators by type of innovation introduced

	Non innovating firms	Innovators (general)	Product innovations	Process innovations	Organisational/managerial/marketing innovations
Employees	7	18	19	23	23
Age	20	21	21	22	21
Leverage *	3.9	5.7	5.6	5.6	3.9
Turnover growth * and**	53	128	2	259	304
Labour productivity *	2.15	2.44	2.17	2.22	2.35
Group ***	4%	8%	8%	8%	10%
Local Network ***	30%	44%	43%	47%	44%
R&D ***	3%	26%	31%	31%	28%
R&D intensity †	0.19	2.24	2.82	2.54	2.57
external R&D ††	28.80	30.23	29.78	29.29	31.94
external R&D †††	25%	37%	37%	38%	38%

Note: Data refer to industrial firms. Values reported in the table are averages.

* The variable has been standardised by sector and time: each observation has been divided by the median value of the sector-specific distribution in the reference year.

** The values refer to the preceding wave.

*** Share of firms

† R&D expenditure over total sales

†† Percentage of R&D expenditure

††† Share of firms engaged in R&D

Source: MET sample survey, waves from 2008 to 2015 (pooled dataset).

To this extent Table C.8 compares innovators with non-innovating firms along four perspectives: structural characteristics (size, age, group and local network memberships), economic performances (financial leverage and turnover growth rates), labour productivity and research and development behaviours. The last three columns of the table report the same information for the subgroups of product, process and organisational/managerial/marketing innovators, in order to detect the presence of possible differences across the three varieties³³.

As expected, innovators are structurally more complex than non-innovating firms. Indeed, on average, they are larger and take more often part to corporate groups and local networks than the other business activities. All these traits also suggest that innovators are more able to coordinate internal and external resources to interact with and learn from the surrounding environment.

Their superior ability in managing and processing new knowledge is also mirrored by the data on R&D activities. As a matter of fact, they not only display a disproportionately higher propensity to undertake research projects and devote a larger share of their turnover to these activities, but they also tend to collaborate more often, and to a greater extent, with other entities to carry out these ventures.

This level of dynamism goes hand in hand, on the one hand, with higher levels of productivities and of past turnover growth rates –except for product innovators- and, on the other hand, with higher levels of indebtedness proxied by the financial leverage. The first results suggest that firms facing an increasing demand may adopt new production methods and/or organisational practices in order to improve their efficiency and gain their profits, while the second evidence point out that innovative activities are extremely expensive (especially when coupled with R&D). On the contrary, the ex-ante low average growth rate associated with product innovators is a further sign that firms introduce new varieties of commodities to meet new demands, thus, seeking to improve their economic outcomes.

On balance, the data reported in Table C.8 suggest that innovation is enabled by superior organisational abilities linked to learning and management processes as well as to the access to the necessary amount of resources needed to develop new ideas and turn them into efficient strategies.

³³ Notice that the three subgroups are not mutually exclusive: as a matter of fact, a firm may introduce at the same time more than one type of innovation.

5 HETEROGENEITY AMONG INTERNATIONALIZED FIRMS

This section further analyses heterogeneities within Italian companies by inspecting different modes of internationalisation. The analysis compares structural characteristics, performance, and behavioural patterns by exploiting wide set of information drawn from ISTAT and MET firm level databases.

The main evidences can be summarised as follows:

- As many streams of the literature have pointed out, internationalisation is the result of multifaceted processes whereby technological knowledge, organisational capabilities and learning abilities interact with the foreign environment producing different performances and organisational patterns.
- During the last years there have been large flows of firms entering and exiting international markets. These flows are associated especially with the simplest forms of internationalisation: i.e. simple export and import activities.
- These simple forms of internationalisations are also associated with a narrow number of exports/imports markets, as well as a narrow range of products sold on/bought from international markets.
- Once focusing on more complex forms of internationalisation, the share of companies that returned on domestic markets drops considerably while its increases the rate of persistency within a specific activity.
- In accordance with the idea that internationalisation activities and competitiveness are two reinforcing phenomena, the data show that the more complex is the type of relationship with the foreign environment, the more complex is the structure of the organisations falling within that category. Indeed more complex internationalisation modes are associated with larger (median) number of employees working within the firm.
- More complex forms of internationalisation require more complex structures in order to accomplish a wider range of tasks (e.g. knowledge of institutional and legal aspects of foreign countries, higher technological competition etc.). To this extent, the more complex the form of internationalisation the higher the propensity to undertake innovative activities, to hire high skilled human capital and dedicated management.
- The higher demand for skilled labour turns into higher labour costs per employee: the fact that more productive firms pay more their labour force suggests that success on foreign markets follows more from technological rather than cost competitiveness.
- Productivity is positively associated both with internationalisation modes (e.g. “Global exporters” exhibit a median value added per employee that almost doubles the one associated with “simple exporters/importers”) and with innovative activities. Evidences highlight that innovation discriminates productivity levels within a certain type of internationalisation activity (e.g. “two-way-traders” are more productive than “simple exporters”, nevertheless “two-way-traders with R&D” are more innovative than “two-way-traders without R&D”). This does not identify any causal relationship among the three variables. Rather, it highlights a multifaceted phenomenon that will be further investigated via econometric models.

Hitherto, the analyses have interpreted external competitiveness as that ability of a firm to sell its products on the international markets. Whilst there is no doubt that export activities require an organisation to be highly competitive, internationalisation and external competitiveness are broader phenomena. Indeed, as many streams of the literature have pointed out, internationalisation is the result of multifaceted processes whereby technological knowledge, organisational capabilities and learning

abilities interact with the foreign environment producing different performances and organisational patterns (Castellani and Zanfei, 2006). As such, the analysis needs to focus on this variety of forms in order to frame the results provided in the previous pages.

Table C.10: Transition matrix of firms' internationalisation statuses between 2011 and 2014

		2014						
		Non active abroad	Only exporters	Only importers	Two-way traders	Global	MNE IT	MNE Foreign
2011	Non active abroad	92.20	3.85	2.92	0.89	0.02	0.08	0.02
	Only exporters	28.23	51.40	2.88	14.97	2.15	0.31	0.05
	Only importers	35.94	5.10	44.05	14.08	0.14	0.52	0.16
	Two-way traders	8.76	14.01	6.99	60.70	7.78	1.53	0.23
	Global	3.11	5.43	0.30	11.57	73.88	4.91	0.80
	MNE IT	4.99	2.16	1.00	4.90	7.13	76.84	2.99
	MNE Foreign	3.61	1.25	0.91	3.00	2.77	5.13	83.33

Note: Data refer to the population of manufacturing business activities active from 2011 to 2014. Each row is related to a specific internationalisation mode undertaken by firms in 2011 and represents the distribution of internationalisation behaviours in 2014. The taxonomy is the same employed by ISTAT in the 'Rapporto sulla competitività dei settori': 'Non active abroad' refers to organisations without any tie with international markets; 'Only exporters' are firms that export (part of) their products abroad, 'Only importers' encompass business activities that import (part of) their inputs and sell their products on the national market only; 'Two-way traders' include all the firms exporting and importing at the same time; 'Global' refer to organisations selling their products in at least 5 areas outside the European Union; 'MNE IT' and 'MNE Foreign' are two groups including firms belonging to a multinational group (with the headquarters located inside or outside Italy respectively). Whilst, in principle, a firm may belong to more than one of these groups at the same time, the variable has been set up as an ordinal measure with mutually exclusive categories and higher importance is given to more complex behaviours. To this extent, for example, a two-way-trader exporting in more than 5 areas outside the European Union is included in the Global group; however, if it is also part of an Italian multinational, it is included in the MNE IT group instead.

Source: elaborations on microdata from the Italian National Institute of Statistics (ISTAT).

Table C.9 reports the transition matrix of the different modes of internationalisation undertaken by the population of Italian firms during the period 2011-2014. The taxonomy is drawn from ISTAT and identifies seven groups, each one characterised by a specific degree of complexity. The first category refers to non-internationalised firms. The second and the third ones are associated with the simplest forms of internationalisation by gathering all those companies that either export or import ('only exporters' and 'only importers'). The fourth class includes all the businesses that export and import at the same time ('two-way-traders') while the fifth class digs further into export activities by grouping all the companies that sell products in at least five geographic areas outside the European Union ('global'). Finally, the last two categories refer to those firms taking part to a multinational group with each category defined according to the nationality of the company heading the group ('MNE IT' and 'MNE Foreign'). Although a firm may belong to more than one group, the classes have been defined in a mutually exclusive way. To this extent, for example, an exporter selling its products in more than five geographical areas outside EU is a global firm. However, if it belongs to a multinational corporate group, it falls within the corresponding MNE class.

Overall the results highlight that higher complexity in the activities characterising the internationalisation mode is associated with a higher persistence of the phenomenon. Indeed, exporting in few countries or simply importing from abroad are highly unstable activities. As soon as we move

from these simple forms to two-way traders, Global firms or multinational enterprises, the rate of persistence in specific internationalisation statuses overcomes 60%.

On top of that, the degree of regression to a domestic status drops considerably with the rise of the degree of complexity of the internationalisation activities. As a matter of fact, the share of simple importers that ceased of being internationalised during the period 2011-2014 amounts to 36%, that of simple exporters equals 28%, whilst for two-way-traders, global business activities and firms taking part to a multinational enterprise this percentage fall short of 10%.

At the same time, the transition matrix also reveals that the internationalisation process of a business activity is highly difficult. Indeed, over 9 out of 10 firms that were domestic in 2011 remained domestic in 2014.

All these evidences are in line with the views associating the degree of complexity of the activities carried out by a firm on international markets with its level of competitiveness. On top of that, the international environment may also represent a channel through which the business organisation gets in touch with new knowledge. To this extent, it is reasonable to assume that these phenomena are linked by bidirectional relationships.

The analysis of the main characteristics of each category are consistent with both interpretations. Table C.10 compares the internationalisation statuses by reporting the main features of each mode drawn from the ISTAT micro-database. In accordance with the idea that internationalisation activities and competitiveness are two reinforcing phenomena, the data show that the more complex is the type of relationship with the foreign environment, the more complex is the structure of the organisations falling within that category. Indeed more complex internationalisation modes are associated with larger (median) number of employees working within the firm. In particular, the widest size gap occurs when passing from being a simple internationalised business activity to an organisation taking part to a multinational enterprise. Moreover, even without considering these types of businesses, the more composite is the activity on foreign markets, the higher the tendency of establishing formal relationships with other business organisations by participating to business groups and the higher the ability to reach and operate on distant markets.

Furthermore, in line with the analyses put forth in the previous chapter, all these structural evidences are also mirrored by productivity advantages. In this respect, the data in Table C.10 suggest that productivity increases along with the type of internationalisation carried out, and not only when passing from non-internationalised to internationalised businesses. For example, Global exporters exhibit a median value added per employee that almost doubles the one associated with simple exporters/importers.

Table C.11: Main characteristics of firms by internationalisation activity

	Share of total firms	Employees per firm	Group membership	VA per employee	Labour cost per employee	Export intensive margins	Exporters reaching extra-UE
	column %	median	% of firms	median	median	median	% of exporters
Non active abroad	71.7	2.0	2.8	18.14	22127.0	0.0	0.0
Only exporters	8.3	4.2	6.8	30.20	28127.3	4.8	38.7
Only importers	5.7	4.0	8.4	30.07	27934.0	0.0	0.0
Two-way traders	8.4	10.0	16.6	43.89	33245.8	7.9	52.3
Global	3.5	19.8	28.7	54.67	38479.3	46.6	100.0
MNE IT	1.6	41.3	100.0	64.67	45152.5	37.2	n.a.
MNE Foreign	0.8	46.3	100.0	70.12	51324.6	36.1	70.6
Total	100.0	2.3	7.9	22.22	26115.2	4.6	44.7

Note: Data refer to the population of manufacturing business activities active in 2014. The taxonomy is the same employed by ISTAT in the 'Rapporto sulla competitività dei settori': '*Non active abroad*' refers to organisations without any tie with international markets; '*Only exporters*' are firms that export (part of) their products abroad, '*Only importers*' encompass business activities that import (part of) their inputs and sell their products on the national market only; '*Two-way traders*' include all the firms exporting and importing at the same time; '*Global*' refer to organisations selling their products in at least 5 areas outside the European Union; '*MNE IT*' and '*MNE Foreign*' are two groups including firms belonging to a multinational group (with the headquarters located inside or outside Italy respectively). Whilst, in principle, a firm may belong to more than one of these groups at the same time, the variable has been set up as an ordinal measure with mutually exclusive categories and higher importance is given to more complex behaviours. To this extent, for example, a two-way-trader exporting in more than 5 areas outside the European Union is included in the Global group; however, if it is also part of an Italian multinational, it is included in the MNE IT group instead.

Source: elaborations on microdata from the Italian National Institute of Statistics (ISTAT). The last column refers to MET survey database.

As a consequence, technological superiority brings about a higher demand for skilled labour, which turns into higher labour costs per employee. Once more, the fact that more productive firms pay more their labour force suggests that success on foreign markets follows more from technological rather than cost competitiveness.

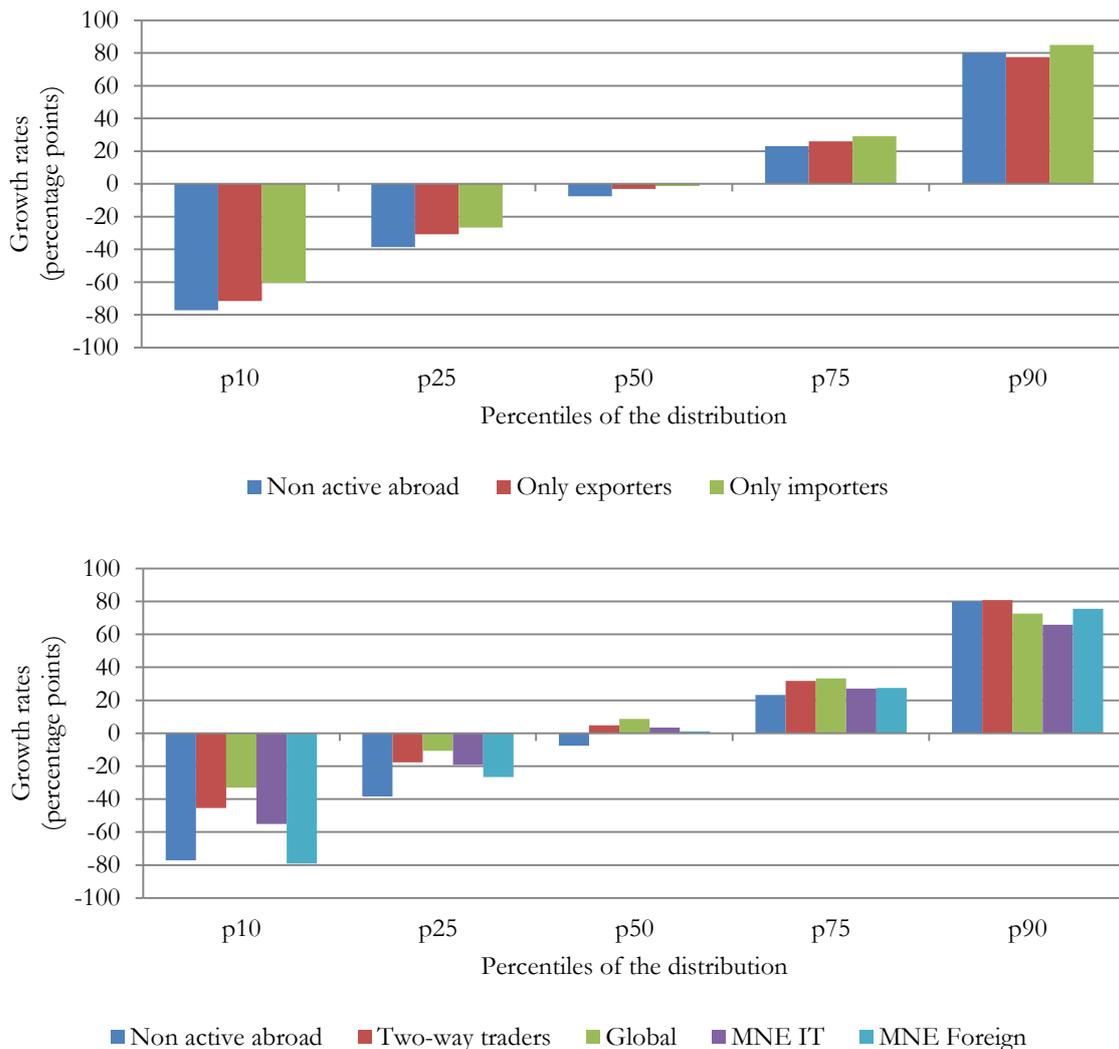
A proof of this success is provided by the average degree of dependence from the turnover produced on foreign markets. As a matter of fact, complex export activities are coupled with higher export intensive margins. Nevertheless, contrary to what happens for the other variables, the data on intensive margins reported in Table C.10 reveal that the highest levels are not associated with firms taking part to a multinational enterprise, but, instead, with global exporters.

Moreover, the degree of complexity of international activities is positively correlated with the ability of a firm to reach extra-UE markets. Indeed, both two-way-traders and foreign controlled companies are more likely to sell products outside the Union than simple exporters. The geographical distance of the markets served is strictly related to the firm size: only 34% of micro-sized exporters succeeds in overcoming UE boundaries while, starting from 10 employees onward, this percentage overtakes 60%, reaching 71% when considering large exporters only.

In terms of performances, during the 2011-2014 period, internationalised firms often outmatched domestic firms. Indeed, by comparing the main percentiles of the distributions of value added growth rates across the modes defined by ISTAT, domestic firms turn out to lag behind internationalised business activities up to the 90th percentile (Figure C.16). Yet, in the last part of the right tail of the distribution, the chart shows that there is a significant group of non-internationalised organisations that grew as much as, or even faster than, their internationalised counterparts. In particular, high-growth domestic firms outpaced simple exporters, global business activities, and companies belonging to a multinational enterprise, whereas expanded at the same rate as two-way-traders. These evidences are in line with what described in the previous chapter and in Box 3 about the high-growth non-exporting firms' phenomenon.

When focusing on internationalised firms only, in general, more complex activities on international markets are paired with higher value added growth rates up to the 90th percentile. The only exception is represented by organisations belonging to a multinational enterprise (especially those with a foreign headquarter). As a matter of fact, the companies belonging to these categories exhibit worse value added growth performances than two-way traders and global firms. Even though these descriptive statistics are not able to pinpoint the factors underpinning this outcome, it is reasonable to assume that this result may be partly due to the way multinational groups spread the overall value added across their members.

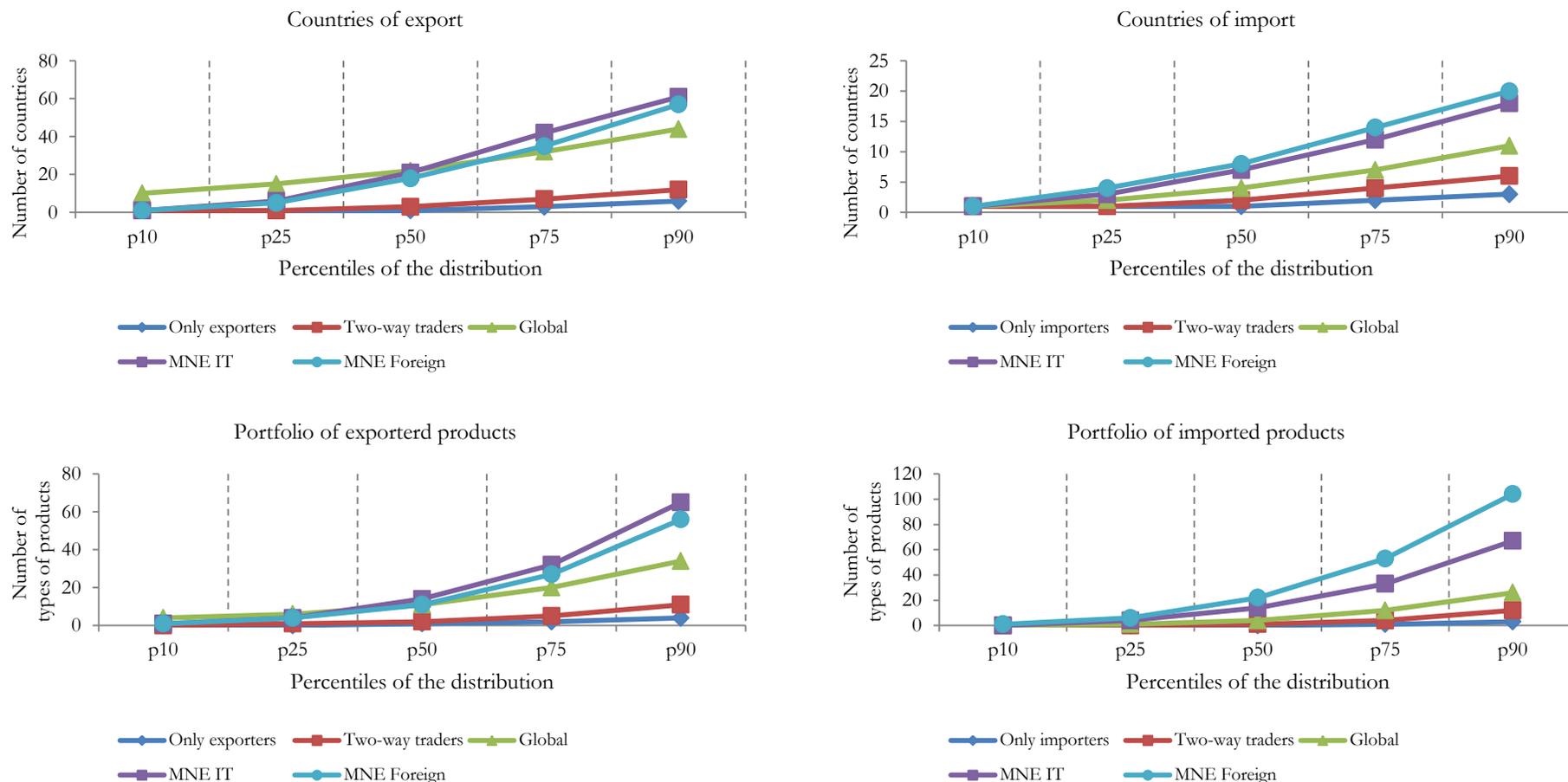
Figure C.16: Distribution of value added growth rate for each type of internationalisation activity



Note: The chart reports the distributions of the 2011-2014 growth rates of firm-level value added for each type of internationalisation activities. The taxonomy is the same employed by ISTAT in the 'Rapporto sulla competitività dei settori': 'Non active abroad' refers to organisations without any tie with international markets; 'Only exporters' are firms that export (part of) their products abroad, 'Only importers' encompass business activities that import (part of) their inputs and sell their products on the national market only; 'Two-way trader' include all the firms exporting and importing at the same time; 'Global' refer to organisations selling their products in at least 5 areas outside the European Union; 'MNE IT' and 'MNE Foreign' are two groups including firms belonging to a multinational group (with the headquarters located inside or outside Italy respectively). Whilst, in principle, a firm may belong to more than one of these groups at the same time, the variable has been set up as an ordinal measure with mutually exclusive categories and higher importance is given to more complex behaviours. To this extent, for example, a two-way-trader exporting in more than 5 areas outside the European Union is included in the Global group; however, if it is also part of an Italian multinational, it is included in the MNE IT group instead. 'Non active abroad' firms are reported in both graphs as a benchmark.

Source: elaborations on microdata from the Italian National Institute of Statistics (ISTAT).

Figure C.17: Internationalisation statuses and types of export and import activities



Note: Data refer to the population of internationalised industrial firms in 2014. *Countries of export*: number of countries where a firm exports its products/services. *Countries of import*: number of countries from which a firm imports its (material) inputs. *Portfolio of exported products*: number of types of products a firm exports on foreign markets. *Portfolio of imported products*: number of types of products a firm imports from foreign markets. The taxonomy is the same employed by ISTAT in the ‘Rapporto sulla competitività dei settori’: ‘*Non active abroad*’ refers to organisations without any tie with international markets; ‘*Only exporters*’ are firms that export (part of) their products abroad, ‘*Only importers*’ encompass business activities that import (part of) their inputs and sell their products on the national market only; ‘*Two-way trader*’ include all the firms exporting and importing at the same time; ‘*Global*’ refer to organisations selling their products in at least 5 areas outside the European Union; ‘*MNE IT*’ and ‘*MNE Foreign*’ are two groups including firms belonging to a multinational group (with the headquarters located inside or outside Italy respectively). Whilst, in principle, a firm may belong to more than one of these groups at the same time, the variable has been set up as an ordinal measure with mutually exclusive categories and higher importance is given to more complex behaviours. To this extent, for example, a two-way-trader exporting in more than 5 areas outside the European Union is included in the Global group; however, if it is also part of an Italian multinational, it is included in the MNE IT group instead.

Source: elaborations on microdata from the Italian National Institute of Statistics (ISTAT).

As for the last part of the distributions (i.e. from the 90th percentile onward), Figure C.14 reveals that ‘only exporters’ and ‘only importers’ exhibit higher values than global firms, whereas two-way traders show a smaller value than simple importers. Again, these evidences seem to confirm that harsh levels of competitiveness on foreign markets brought about an erosion of value added margins and curbed the highest growth rates. To this extent, the more a firm is internationalised, the more its value added growth rates are restricted by its competitors. In addition to that, this outcome may also follow from the size differences highlighted in Table C.10. Indeed smaller organisations (associated with simpler internationalisation modes) are more likely to experience faster growth episodes than larger ones (more often connected with complex internationalisation statuses).

As stated in the review of the literature, competitiveness on foreign markets is a multifaceted phenomenon that can be interpreted in various ways. Among others, some theories suggest that it is linked to the portfolio of competencies a firm is endowed with (see Castellani and Zanfei, 2006 for an explanation of this stream of literature). As a matter of fact, competencies allow the organisation to manage a wide range of activities at the same time, and, thus, the greater the number of competencies the greater the number of activities carried out by the company. In this vein, an indirect measure for external competitiveness is represented by the number of countries a firm is able to export in/import from at the same time, as well as by the number of product varieties it sells on/buys from foreign markets. The graphs in Figure C.17 compare the main percentiles of the distributions of these phenomena across the different internationalisation modes. The data are drawn from the ISTAT micro-database and refer to the year 2014.

According to the panels on the left-hand side of the figure, the great majority of the Italian exporters reaches few international markets and exports a narrow range of products. As a matter of fact, among simple exporters, both the median number of international markets served by each firm and the median number of varieties of products sold abroad equal to 1. Among two-way-traders, these values increase slightly and amount to 3 and 2 respectively. However, once we consider global and multinational enterprises the picture changes radically. Indeed, among global exporters and multinational enterprises, at least 50% of companies serve, each one, 18 or more foreign markets, whereas, the median number of types of products sold abroad ranges from 11 (global exporters) to 14 (multinational enterprises with foreign headquarters).

On top of that, the variance of these phenomena increases along with the degree of complexity of international activities. For example, the 25th percentile of the distribution of the number of exported varieties amounts to 1 in the case of two-way-traders and to 4 in the case of Italian MNEs, while the 75th percentile of the same distribution equals 5 in the case of two-way-traders and 32 in the case of Italian MNEs.

Similar considerations can be drawn when focusing on importing instead of exporting activities (right-hand-side panels). In fact, the majority of importers restock on few international markets and for few types of goods, and the variance of the distribution goes hand in hand with the degree of complexity of international activities. In this case, nevertheless, global firms’ performance is more similar to simple importers and two-way-traders than before. This result is probably due to the fact that import activities play a strategic role for multinational firms and, as such, the behaviour of these two groups is quite peculiar if compared to the one associated with the other categories.

On balance, however, two important evidences can be drawn from these graphs. First of all, the number of export/import markets and the variety of products exported/imported mirror the degree of complexity of the international activities. To this extent, the more complex the activity the wider the range of markets reached and the portfolio of goods exchanged. Secondly, the more complex the internationalisation mode the wider the range of performances achievable by the firm. This implies that whilst the capabilities allowing the business to reach superior performances are associated with complicated international activities, they are not granted automatically when these activities are carried out.

An element that may be connected with all these results is represented by innovation. As a matter of fact, internationalisation and technology are strictly bound one each other. On the one hand, organisations may introduce new products, processes or organisational/managerial/marketing procedures in order to be sufficiently competitive to enter and operate on foreign markets. On the other hand, business activities may learn from the surrounding environment, thus increasing the stock of knowledge needed to innovate. Hence, any international activity involves not only flows of goods, but also flows of information that may form new technological and organisational knowledge endowing the firm with more capabilities.

Table C.12: Innovative activities and internationalisation statuses

	Innovation (at least one type)	Product innovation	Process innovation	Organisational, management, marketing	R&D	R&D carried out with external partners
	% of firms	% of firms	% of firms	% of firms	% of firms	% of R&D firms
Exporters	42.9	31.8	22.4	18.5	31.0	41.8
Two-way traders	51.6	39.1	28.6	24.5	39.3	48.6
GVC	47.6	35.5	26.0	22.2	34.5	47.5
Global exporters	49.5	42.0	26.4	22.2	44.8	45.9
FDI	74.1	66.6	49.0	40.5	59.9	49.4
Foreign controlled	56.0	42.4	33.5	28.1	54.0	48.2

Note: Data refer to industrial sectors. The internationalisation statuses have been set up by means of the MET sample survey. Differently from the ISTAT taxonomy, these categories are not mutually exclusively. Exporters: includes business activities only exporting (part of) their products abroad. Two-way-trader: includes firms exporting and importing at the same time. GVC: The MET dataset conveys qualitative information on import and export activities, as well as on the main type of product exported (semi-finished products, final goods, and services). Because intermediate products are typically employed in a broader production process, we regard exporters of semi-finished goods and components to be (reasonably) part of a GVC. Similarly, a company importing its inputs and exporting final goods is totally integrated in an international framework and is expected to participate in a production on global scale. A certain degree of ambiguity arises when companies are, to some extent, internationalized; either import input factors or export final products. For this group, we condition a firm's inclusion in GVCs to its involvement in global networks. This information is inferred from an additional question in the MET survey asking about the existence of "long-lasting and significant relationships with foreign companies". Although this definition is not based on an objective scale, it leaves to the firm the evaluation of whether the international linkage is non-occasional and represents an important activity for its own business. This piece of information allows to rule out from our GVC measure firms that occasionally search for new markets and cheaper inputs (roughly 75% of the ambiguous cases). Global exporters: include all the exporters with at least 50% of total turnover stemming from export activities and exporting outside EU. FDI: includes all the business activities undertaking a foreign direct investment abroad. Foreign controlled: includes all those companies participating to a group headed by a foreign firm.

Source: MET sample survey, panel 2011-2013.

Table C.11 reports MET estimates on the diffusion of innovation and R&D across the different modes of internationalisation. The taxonomy employed is slightly different from the ISTAT one as it does not impose that different groups cannot have members in common. Nevertheless, even in this case the classes have been designed in order to reflect an increasing degree of complexity. To this extent the first group is represented by simple exporters, the second one by two-way-traders, the third one by companies taking part to a global value chain (GVC)³⁴, the fourth one by businesses exporting over 50% of their total turnover and reaching markets outside the European Union (Global exporters), the fifth one by organisations undertaking foreign direct investments (FDI), and, finally, the sixth one by companies participating to a group headed by a foreign firm (Foreign controlled).

³⁴ The definition for the participation to a global value chain is reported below Table C.11. For further information on this variable as well as on its relationships with innovative activities look at the dedicated econometric section.

Overall, the data suggest that the propensity to innovate increases along with several dimensions. The first one is the distance: firms able to obtain a significant share of their total turnover on distant markets (global exporters) tend to be more innovative than those falling within the generic class of exporters (49.5% and 42.9% respectively). As these latter are the sum between global and non-global exporters this evidence suggests that companies reaching extra-EU markets and obtaining the majority of their turnover from the international trade are more innovative than those earning the majority of their revenue within the EU boundaries.

The second dimension along which the propensity to introduce an innovation increases is represented by the number of activities carried out on foreign markets. Indeed, firms importing and exporting at the same time are more innovative than mere exporters (even when they export globally). This is consistent with the evidences showing that import activities represent a very important channel for learning processes.

The third element is linked to the nature of the economic activity carried out abroad. As a matter of fact, firms undertaking foreign direct investments are the most innovative group among all the categories.

Finally, the fourth facet is connected with the type of relationships established with the foreign entities. In fact, business activities within a global value chain and those belonging to a foreign multinational enterprise tend to innovate more often than mere exporters. On top of that, among these two groups, foreign controlled firms are more innovative than companies in a GVC. This suggests that formal relationships may be more effective in transmitting knowledge than other possible connections.

Furthermore, in line with the results in Table C.5, the most frequent type of innovation is represented by the introduction of new products, while process and organisational/managerial/marketing innovations lag behind.

Similar evidences can be detected by the analysis of the propensity to engage in R&D activities and of the mode through which these activities are conducted (i.e. internal or, at least partially, in connection with other entities).

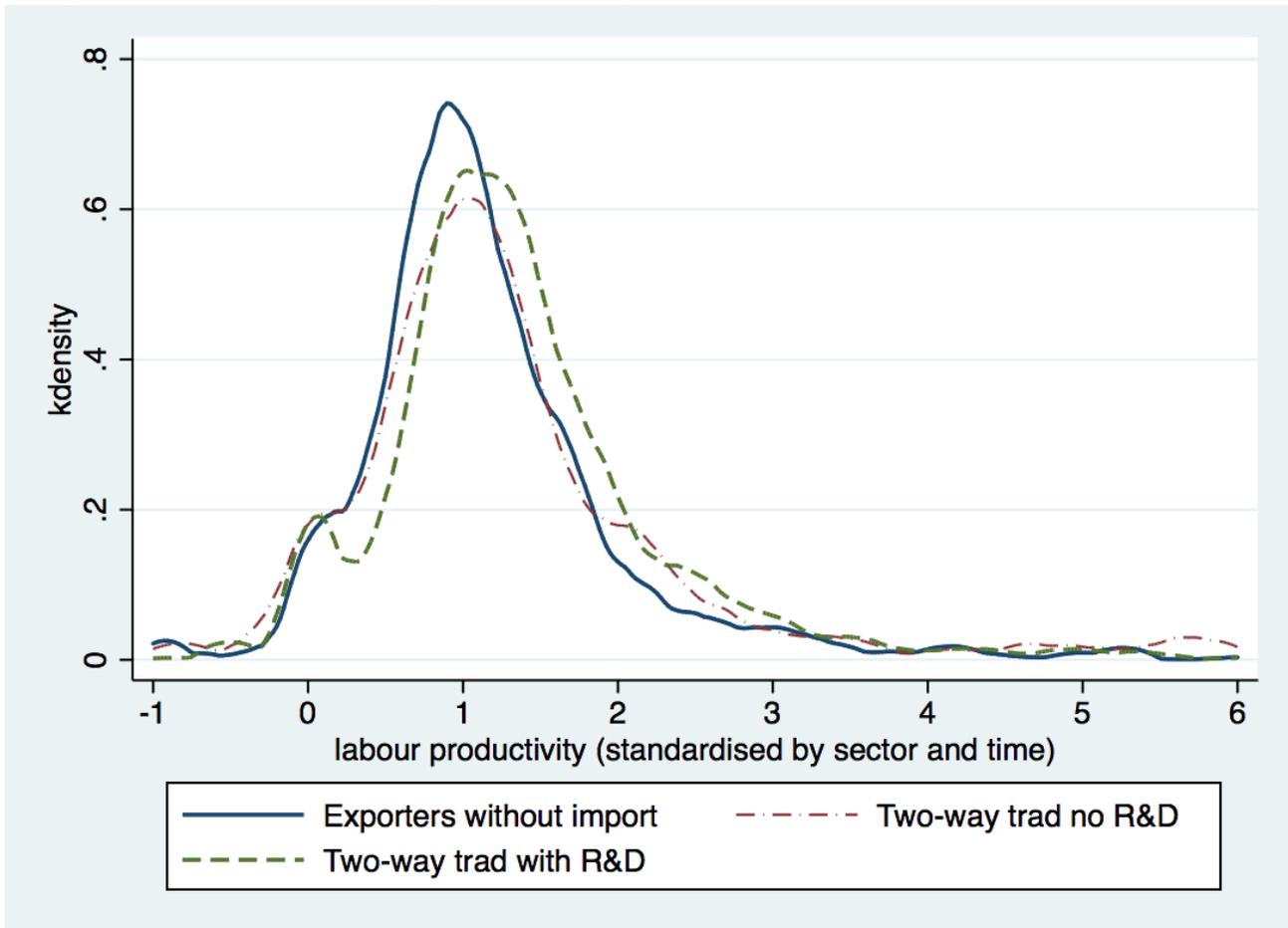
On the basis of the information provided so far, the degree of heterogeneity of internationalised activities cannot be summarised by a single factor but, rather, relates to a multiplicity of dimensions, many of which connected one each other. As a direct consequence, then, the same concept of competitiveness needs to account for a variety of elements to be fully described. In order to be clearer on this aspect, Figure C.18 plots the labour productivity kernel density functions for three groups of firms: only exporters, two-way-traders without any R&D activity and two-way-traders undertaking research projects. As for Figure C.5, estimates are performed by means of the MET survey dataset on a set of productivities standardised by the median value of the corresponding sector-time distribution.

As before, labour productivities are far from being normally distributed since the three functions look more like a Pareto distribution. In this sense, then, internationalisation and innovative activities do not change the fact that the majority of firms fall short of the average productivity while few outstanding organisations reach very high levels of value added per employee.

Nevertheless, this does not mean that these phenomena are not strictly connected one each other. As a matter of fact, even though the shape of the three kernel densities is similar, their position changes along with the number of activities carried out. For example, the distribution of two-way-traders without R&D is shifted rightward with respect to that referred to simple exporters (with and without research), confirming that import activities help the organisation in improving its productivity levels. At the same time, though, the labour productivity distribution of two-way-traders undertaking R&D projects is furtherly shifted rightward with respect to the one exhibited by two-way-traders without research. As such, when we focus on a specific type of internationalisation, innovative activities are able to discriminate productivity levels.

In the end, then these data do not identify any causal relationship among the three variables. Rather, they highlight a multifaceted phenomenon that will be further investigated via econometric models.

Figure C.18: Labour productivity distribution by internationalisation statuses and R&D activities



Note: The chart reports the probability density functions (pdf) for exporters and non-exporting firms' labour productivities, expressed in terms of value added per employee. Pdfs have been estimated non-parametrically via Epanechnikov kernel functions. In order to account for differences across sectors and time, data have been normalised by dividing each observation x_{ijt} by the median value x_{jt}^{med} of the corresponding productivity distribution in sector j at time t . In particular j refer to the two-digit NACE Rev.2 industrial sectors (construction excluded) whereas t refers to the years of the MET sample survey waves (2008, 2009, 2011, 2013, 2015). Source: MET survey, waves from 2011 to 2015 (pooled dataset).

6 ECONOMETRIC ANALYSIS

This section aims at providing additional evidence on the drivers of external competitiveness. A rich set of econometric analyses take advantage of the MET survey to explore whether behind the associations outlined so far, there are causality nexus underlying the phenomena of interest. This section is organized as follows. First, we sketch the econometric strategy employed to dig deeper into the drivers of firms' international performance. Then, we provide an extensive set of results on the extensive and intensive margins of export, highlighting heterogeneities and drivers that are paramount to derive some policy prescriptions.

The main findings are the following:

- More productive companies are typically associated to higher likelihood of exporting: a one-standard deviation increase in productivity is associated to a 1.5% higher probability of export. This evidence is consistent with the literature emphasizing a self-selection of companies in the international markets. Indeed, once accounted for persistent characteristics that do not vary over time (including the higher average productivity of some companies), productivity is found to be largely insignificant in explaining the change in firms' exporting status. On the other hand, productivity has a critical impact on firms' international performance (i.e., intensive margins) and decision to exit the foreign markets (+4% export sales growth and -2% probability of going back domestic).
- Other characteristics play a critical role in firms' export propensity, especially size and the affiliation to a corporate group (respectively, +3% and +2% probability of exporting). Moreover, being an importer of intermediate products is largely associated to a higher probability of exporting (+8%), confirming how import policies may affect aggregate productivity, resource allocation, and industry export activity.
- A prominent effect is found for firms' strategic behaviours and investment in dynamic strategies. The introduction of innovations, the involvement in R&D projects, as well as undertaking new investments, induce a significant effect on export strategies (roughly +2% in export probability) and performance (innovations induce on average a 8%-increase of export sales growth).
- The introduction of innovations is even more important in reaching extra-EU destinations and in affecting firms' switching strategies; i.e., entrance (+2.3%) and exit (-8.5%) from the international markets.
- On the top of their direct impact, there are significant cumulative effects of dynamic strategies. First, the integration of innovation and R&D activities implies premia on both the extensive and intensive margins of export. The coefficients of innovative strategies paired with R&D investment is two-to-three times larger than isolated innovations (4.1% vs 1.7% in the probability of export, and +11.7% vs +6.6% in export sales growth). Moreover, the path followed by the set of dynamic strategies undertaken in the past (adding or reducing the set of strategies, i.e., upgrading/downgrading paths) has additional effects on firms' international attitude (roughly, +5% probability of exporting).
- Among the different types of innovations, new products dominate other forms of innovativeness (process or organisational-managerial), especially in case of previously non-exporting companies (4%-higher probability of exporting). This is because new products are the main form of innovation which is not reflected in the level of productivity. However, we find process and organisational innovations to have an additional indirect effect on export by boosting firms' productivity (+2% productivity growth, +15% if based on matching techniques), while the introduction of new products does not seem to be linked to any productivity growth.
- Innovative strategies are found to have disproportionate effects for the international performance of (originally) less productive and small companies: 17%- and 21%-increase in export growth compared to 7%- and 8%-increase for more productive and larger firms, respectively. This result puts forward innovative strategies as a potential tool to fill the gap between large/productive

companies and the set of less structured firms, that are ideal targets for policy measures.

- A simultaneous equation model (bivariate probit) also emphasizes the main determinants of firms' innovativeness. In this regard, structural characteristics are significantly affecting the introduction of innovations, especially for larger, younger, and more productive companies. The existence of R&D projects is clearly correlated to huge increases in the probability of introducing innovations. Importantly, this effect is not limited to the investment in R&D performed within the firm (internal R&D), but extends to firms outsourcing R&D activities, even though with smaller magnitudes (+8% vs +27% probabilities). Another important factor in driving firms' innovativeness is related to the operating environment of a firm, such as the affiliation to a corporate group (+5%) and the establishment of close relationships with other domestic companies (i.e., networks, +4.5%). Finally, financial constraints are found to significantly affect a firm's capacity to innovate and the establishment of close ties with the main bank is documented to be extremely important in reducing informational asymmetries penalizing innovative SMEs.
- A specific analysis is devoted to the behaviour and performance of Global Value Chains. We design a comprehensive taxonomy of GVC participation modes and explore their positive effect on firms' innovativeness and performance. However, our findings highlight relevant heterogeneities in how GVC participants fared the crisis. While high-skill relational suppliers display a significant propensity to engage in innovative activities and R&D projects, other modes of GVC participation have no premium compared to domestic companies. This heterogeneity is also reflected in differential productivity and sales growth. Compared to the pre-crisis trends, we document a severe demand shock for low-skill and subordinated firms, while relational GVCs appear to be somewhat sheltered from the effects of the crisis.

6.1 ECONOMETRIC STRATEGY

The baseline equation tests the effect of different drivers of external competitiveness on the extensive margins of export (i.e., probability of exporting) according to the following specification:

$$\Pr(Y_{it} = 1) = \Phi(\beta'Z_{it-1} + \lambda_t + c_i + \varepsilon_{it}) \quad (1)$$

where Y_{it} is either a dummy dependent variable identifying export activity (*Export*), or other dimensions of firms' internationalisation. Equation 1 is a standard reduced form including a rich set of regressors (Z_{it-1}) to capture structural characteristics (productivity, size, age, capitalisation, group belonging, degree of vertical integration, cost of labour), financial issues (leverage, trade credit, bank debt, ROA, sales, cash flow) and especially firms' behaviours (innovativeness, R&D, investments, affiliation to networks, import propensity, and human capital). We also include time effects (λ_t) to capture common shocks and cyclical components that vary over time. Finally, c_i is a factor controlling for firms' unobserved heterogeneity, also accounting for permanent industrial/geographical effects (12 controls for the firms' belonging industry, 20 for region, and 110 for geographical province). More details on the definition of all the variables employed can be found in the Appendix.

Notice that common factors and industrial or geographical components may have critical effects within this context. Indeed, the economic cycle, aggregate investment, as well as fluctuations of industrial demand and the external environment (among other common, industrial, or regional factors) are likely to have significant impact on both the extensive and intensive margins of export. Even though these factors are removed (through time fixed effects and sectorial/geographical

interacted time controls) to obtain unbiased estimates useful for policy indications, they allegedly had a prominent role in the definition of a firm's international performance.³⁵

There are two main issues we need to take into account for assessing the effect of different drivers on firms' external competitiveness. The first one has to do with reverse causality, whereby characteristics and behaviours do not foster export performance but instead result from the (a priori) successful penetration into new markets. The second interrelated point is the clear self-selection of more productive and dynamic companies into international environments. Because of the lack of a natural experiment allowing to define a strictly exogenous set of instruments, we try address these issues in several alternative ways.

First of all, we alleviate problems of reverse causality by ruling out simultaneity bias. Matching current export status with lagged regressors partially solves reverse causation but may leave residual endogeneity in case of relevant unobserved heterogeneity or high persistence of Y and Z.

Accounting for firms' unobserved heterogeneity is extremely important to derive policy implications requiring an identification of causal relationships. In general, unobserved heterogeneity refers to relevant variables (in addition to the ones under study) that are unobserved (or not measurable) but are correlated with the observed measures employed. If some firms' characteristics that affect both the left- and right-hand side variables are omitted because they are not observable, the regressors will be correlated with the error term and the regression coefficients will be biased (the direction of the bias will then depend on the correlation between the omitted, dependent, and explanatory variables). For instance, our research aims at studying the effect of firms' innovative strategies on their international propensity. On the top of the rich set of observable characteristics included in all regressions, there will always be some factors that the econometrician cannot measure, such as the specific skills or attitude of a firm's manager. Eventually, the latter may drive both a broader openness to the international markets and a higher propensity to innovate. If we neglected this component, we would get a positive effect of innovation on export that is simply due to unobserved heterogeneity driving the relationship of interest. This issue can be generalized to any unobserved factor having effects on any of the variables included in the specification. The major motivation for employing panel data is the ability to control, at least, for the possibly correlated, time-invariant heterogeneity; that is, the longitudinal model will be purged from any unobserved and observed characteristic that is persistent over the considered time-span.

Dealing with unobserved heterogeneity in a binary-response framework is not trivial. On the one hand, standard random-effects (RE) models impose unrealistic assumptions on the type of heterogeneity that takes place (*i.e.*, c_i must be uncorrelated with the entire set of regressors). On the other, fixed-effects models, that do not impose any hypothesis on c_i , are computationally difficult and introduce an incidental parameter problem leading to inconsistent estimates. Our strategy is in-between the two approaches and relies on RE-probit models augmented with the time average of each regressor (*i.e.*, Mundlak-type controls).

The standard RE-probit model on the full set of covariates

$$\Pr(Y_{it} = 1|Z_{it-1}, c_i) = \Phi(\beta'Z_{it-1} + c_i + \varepsilon_{it}) \quad (2)$$

imposes $c_i|Z_i \sim N(0, \sigma_c^2)$, which implies the assumption of strict independence between firm-specific unobserved heterogeneity (c_i) and the full set of regressors. Because this unrealistic hypothesis would generate biased results in our setup, we follow Wooldridge (2010) and relax it by

³⁵ Notice also that we avoid exploring heterogeneities along industrial or geographical components as they hide unobserved shocks that may reflect other common characteristics across firms that are spuriously correlated with the belonging stratum.

focusing on the effect of each variable in terms of deviations from its time average. This allows us to purge the model from persistent heterogeneity across firms and to derive cleaner policy implications.³⁶ Moreover, to further control for persistence of Y_{it} , we also provide results for the subset of firms with $Y_{it-1} = 0$.

In the unlikely case that residual heterogeneity is still affecting our findings, we run several additional robustness checks. We account for the introduction of unrestricted firm fixed effects through linear probability (within estimators) models purging all the firms' characteristics that are stable over time. Finally, we further take care of self-selection by employing matching techniques (Coarsened Exact Matching) to recover a subsample of companies with the same ex ante probability of export. We then re-estimate our baseline specification for the new subsample of balanced firms to make inference on the treatment effect and provide additional robustness to our results.

The last econometric issue that is worth discussing is the possibility of correlated shocks. In other words, if there is a polarisation of companies within specific industries or geographical areas, the set of parameters β' may be affected by the firms' reaction to unobserved shocks and no longer reflect the impact of some specific drivers. To tackle this concern we enrich our baseline specifications with an extensive set of time-fixed effects specific for firm belonging industry (12 macro-industries \times 5 periods), region (20 \times 5), and geographical province (110 \times 5). This broad set of fixed effects permits us to control for most of the unobserved shocks induced by the Great Recession.

Further analyses are largely in line with the baseline specification. We take advantage of within estimators and quantile regression models (with Mundlak correction) for the intensive margins, as well as linear probability models with firm and time fixed effects.³⁷

6.2 EXTENSIVE MARGINS

This section presents the results of the analysis on firms' probability of export (i.e., extensive margins).

Table D.1 shows some preliminary evidence obtained through pooled probit estimators (estimated coefficients with robust standard errors are reported). Even though this approach neglects firms' unobserved heterogeneity and reverse causality issues, it may still provide useful guidance in the establishment of clean correlations between exporting status and firms' characteristics and behaviours.

There are several issues that is worth mentioning. First, more productive companies are found to be largely associated to higher probabilities of export: a one-standard deviation increase in productivity is associated to a 1.5% higher probability of export. This evidence is broadly in line with the dominant

36 Our estimator can be viewed as a Mundlak (1978) version of the Chamberlain (1980)'s assumption on the correlation between c_i and Z , which requires the milder hypothesis of: $c_i|Z_i \sim N(\psi + \theta' \bar{Z}_i, \sigma_a^2)$, where σ_a^2 is the variance of a_i in $c_i = \psi + \theta' \bar{Z}_i + a_i$, and \bar{Z}_i is the time-average of Z_{it-1} (see Brancati et al., 2017). Notice that this approach is equivalent to a fixed-effects model in which the heterogeneity is projected on the time-mean of the regressors (\bar{Z}_i), allowing to write the latent variable as $Y_{it}^* = \psi + \beta' Z_{it-1} + \theta' \bar{Z}_i + a_i + e_{it}$, with $e_{it} \sim N(0,1)$. As usual, the estimator hinges on the exogeneity of Z_{it-1} conditional on c_i . We verify this hypothesis by adding the vector Z_{it} to our specification and testing the significance of its estimates (as proposed by Wooldridge, 2010). The test never rejects the null, thus providing at least some justification for the strict exogeneity assumption.

37 In RE-Tobit models the dependent variable is allowed to be censored. In our setup, the share of turnover from exported products is bounded in $[0,100]$. Alternatively, we employ within estimator with firm and time fixed effects accounting for continuous dependent variables. If the latter is applied to a dummy variable, a linear probability model is estimated. Even though such a model (born for continuous measures) does not impose any constraint on the admissible values of the dependent variable, it has the advantage of avoiding any restriction on the type of fixed effects that are included. Thus, it provides useful indications on the robustness of the results. Notice also that the estimates from linear probability models can be directly interpreted in terms of marginal effects (i.e., any estimated coefficient $\hat{\beta}$ represents the percentage change in the probability of $Y=1$ as a result of a one-unit increase in the value of the regressor).

literature on firms' internationalisation. However, given the type of econometric analysis performed, that neglects persistent heterogeneity across firms, little can be said on whether this effect is linked to reverse causality, the ex-ante self-selection of more productive companies into international markets, or even learning by exporting phenomena. The role of productivity on firms' probability of export will be further explored in the following analyses.

Second, structural characteristics play a critical role for firms' exporting status. In particular, firm size and the belonging to corporate groups are associated to increases in a company's probability of exporting. On the other hand, firms' age is found to be largely insignificant, and the coefficients of firms' degree of capitalisation is very unstable across specifications.

A prominent effect is found for firms' strategic behaviours. Being an importer of intermediate products is largely associated to a higher probability of exporting (33% probability). This result is in line with the extant literature emphasizing how import policies may affect aggregate productivity, resource allocation, and industry export activity along both the extensive and intensive margins (see for instance Amiti and Konings, 2005; Halpern, Koren, and Szeidl, 2015; Kasahara and Lapham, 2013; Kasahara and Rodrigue, 2008). Importantly, the introduction of innovations, the involvement in R&D projects, as well as undertaking new investments, are strongly correlated with export strategies. At this stage though, the estimates do not allow to make inference on the direction of causality underlying these relationships.

As expected, past performance are positively related to firms' exporting status, but, once again, this analysis does not shed light on whether the direction of causality is reversed (i.e., the access to international markets allowed firms to experience higher sales growth).

Consistently with the recent trends in international trade that brought the surge of Global Value Chains, increasing fragmentation of the production process (i.e., low degree of vertical integration) is associated with a positive probability of internationalisation, allegedly capturing a higher propensity to participate in the production on global scale.

Furthermore, large weights of labour cost (on total costs of production) are negatively affecting a firm's probability of export, possibly capturing a component of cost competitiveness (once controlling for the level of capital intensity).

Financial issues play a critical role too. Highly leveraged companies, rationed out the credit market, have a lower capacity of penetrating international markets, possibly because of the difficulties in tapping external funds. In line with this finding, a firm's ability to access bank debt and trade debt is positively associated to export activity. Finally, the quality of human capital (defined as the share of graduated employees) fosters firms' international propensity, while the existence of relevant domestic networks seems to be negatively related to firm export status. The last finding may be linked to the lower demand shock experienced by domestic companies involved in stable networks.

These results, are stable across a number of robustness checks (see the appendix for details) controlling for more detailed geographical components (province fixed effects), for correlated shocks at the region and/or industry levels through the introduction of industry*time and region*time fixed effects. Finally, the estimates are virtually unchanged if we focus on the subsample of companies operating in the manufacturing sector only (Tables E.1-E.3).

Notice that the sample size varies considerably across columns because additional variables require detailed information in the balance-sheet data that sometimes is not reported. This is a common problem in every econometric estimation that has to deal with the trade-off between sample size and problems of model misspecification. By adding more and more variables, the so-called omitted-variable bias is reduced, but the price to pay is a reduced size of the sample. Notice however that the unbiasedness of the results is ensured by the stability of the coefficients presented. Indeed, the progressive insertion of additional variables, and the resulting loss of observations, does not pose any threat as long as the key coefficients of interests keep having the same sign, statistical significance, and similar magnitudes. This indicates that the selection imposed on the model is close to be orthogonal to the main regressors.

Table D.1: Probability of export: baseline regression

Y:	Export					
	(1)	(2)	(3)	(4)	(5)	(6)
Productivity	0.0151*** (0.0016)	0.0116*** (0.0016)	0.0167*** (0.0022)	0.0281*** (0.0022)	0.0208*** (0.0046)	0.0186*** (0.0056)
Size	0.0612*** (0.001)	0.0464*** (0.001)	0.0488*** (0.001)	0.058*** (0.001)	0.056*** (0.003)	0.056*** (0.003)
Age	-0.001 (0.002)	0.001 (0.002)	-0.001 (0.002)	-0.003 (0.002)	-0.009** (0.004)	-0.0107*** (0.004)
Capitalisation	0.0038*** (0.001)	0.0035*** (0.001)	0.0038*** (0.001)	0.001 (0.001)	-0.006*** (0.002)	-0.006*** (0.002)
Group	0.042*** (0.005)	0.0325*** (0.005)	0.0281*** (0.005)	0.019*** (0.005)	0.006 (0.008)	0.003 (0.008)
Import	0.360*** (0.005)	0.330*** (0.005)	0.358*** (0.006)	0.346*** (0.006)	0.336*** (0.011)	0.343*** (0.011)
Innovation	--	0.0558*** (0.004)	0.0544*** (0.004)	0.0531*** (0.004)	0.0516*** (0.007)	0.053*** (0.008)
R&D share	--	0.004*** (0.000)	0.004*** (0.000)	0.004*** (0.000)	0.004*** (0.000)	0.004*** (0.000)
Investment	--	0.0125*** (0.003)	0.0123*** (0.004)	0.0132*** (0.004)	0.0100 (0.007)	0.009 (0.007)
Sales	--	--	0.001 (0.002)	-0.019*** (0.003)	-0.011* (0.005)	-0.010* (0.005)
Sales growth	--	--	0.004 (0.004)	0.0108** (0.004)	0.017** (0.009)	0.021** (0.009)
ROA	--	--	0.0109 (0.018)	0.028 (0.019)	-0.041 (0.056)	-0.023 (0.056)
Vertical int.	--	--	--	-0.253*** (0.011)	-0.222*** (0.0325)	-0.232*** (0.032)
Cost of labor	--	--	--	-0.004 (0.004)	-0.074* (0.0404)	-0.063 (0.0404)
Leverage	--	--	--	--	-0.0272*** (0.004)	-0.027*** (0.004)
Net acc. payable	--	--	--	--	0.112*** (0.0211)	0.111*** (0.0211)
Bank debt	--	--	--	--	0.102*** (0.024)	0.107*** (0.024)
Human capital	--	--	--	--	--	0.145*** (0.021)
Domestic net.	--	--	--	--	--	-0.031*** (0.007)
Constant	-1.280*** (0.072)	-1.293*** (0.073)	-1.503*** (0.092)	-1.588*** (0.092)	-0.825*** (0.193)	-0.724*** (0.195)
Controls						
Region	yes	yes	yes	yes	yes	yes
Industry	yes	yes	yes	yes	yes	yes
Time	yes	yes	yes	yes	yes	yes
Mundlak	no	no	no	no	no	no
Observations	50,242	50,242	41,757	41,756	13,420	13,209
Pseudo R2	0.217	0.239	0.239	0.249	0.272	0.278

Notes: pooled probit models (marginal effects). The dependent variable is the extensive margin of export (Export), a dummy variable identifying exporting companies. Datasource: yearly balance-sheet data (Cribis D&B) and MET surveys 2008, 2009, 2011, 2013, and 2015. All measures are defined in Appendix. *, **, *** denote, respectively, significance at 10%, 5%, and 1% level. Robust standard errors in parentheses.

Vice versa, little can be said on unstable coefficients whose changes can be either driven by sample selection or due to omitted variable bias. This is why, in the following estimations we focus our discussion only on features and strategies that across specifications are found to have consistent effects on firms' internationalisation.

Since these results may be affected by persistent unobserved heterogeneity across firms (such as managers' attitudes and skills), Table D.2 accounts for this issue by presenting RE-probit models with Mundlak correction (columns 1 to 4) and within estimators with firm and time fixed effects (columns 5 to 8).

Table D.2: Probability of export: controlling for unobserved heterogeneity

Y: Estimator:	Export							
	RE-Probit with Mundlak				Linear probability model			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Productivity	-0.001 (0.002)	0.0011 (0.002)	-0.0002 (0.0017)	0.002 (0.002)	0.006* (0.003)	0.008 (0.011)	0.004 (0.004)	0.006 (0.011)
Size	0.0168*** (0.003)	0.0305*** (0.004)	0.0177*** (0.0032)	0.0317*** (0.0044)	0.023*** (0.004)	0.054*** (0.012)	0.020*** (0.004)	0.050*** (0.012)
Age	-0.0012 (0.002)	-0.002 (0.002)	0.000 (0.002)	-0.001 (0.002)	-0.000 (0.003)	-0.002 (0.006)	0.000 (0.003)	-0.005 (0.006)
Capitalisation	0.001 (0.001)	0.002 (0.002)	0.0012 (0.0013)	0.002 (0.002)	0.000 (0.001)	0.007* (0.004)	0.000 (0.001)	0.005 (0.004)
Group	0.0119* (0.006)	0.0202** (0.008)	0.0127* (0.0068)	0.022*** (0.008)	0.019** (0.008)	0.040*** (0.015)	0.028*** (0.008)	0.046*** (0.015)
Import	0.084*** (0.004)	0.073*** (0.005)	0.084*** (0.005)	0.074*** (0.005)	0.250*** (0.006)	0.178*** (0.012)	0.245*** (0.006)	0.177*** (0.012)
Innovation	0.011** (0.0045)	0.0131*** (0.005)	0.0133*** (0.004)	0.0163*** (0.005)	0.016*** (0.005)	0.018* (0.009)	0.015*** (0.005)	0.019* (0.010)
R&D share	0.0021*** (0.001)	0.0021*** (0.001)	0.0021*** (0.001)	0.002*** (0.001)	0.003*** (0.000)	0.003*** (0.001)	0.003*** (0.000)	0.003*** (0.001)
Investment	0.0143*** (0.0045)	0.0157*** (0.005)	0.0125*** (0.005)	0.0153*** (0.005)	0.025*** (0.005)	0.023** (0.010)	0.024*** (0.005)	0.023** (0.010)
ROA	-0.007 (0.045)	-0.007 (0.045)	0.125 (0.195)	-0.026 (0.045)	-0.001 (0.011)	0.034 (0.088)	-0.004 (0.011)	0.068 (0.090)
Vertical int.	0.0122 (0.017)	0.0116 (0.029)	0.009 (0.017)	0.0119 (0.029)	-0.019 (0.017)	-0.017 (0.054)	-0.005 (0.017)	-0.004 (0.057)
Cost of labor	0.0112 (0.029)	0.0257 (0.045)	0.011 (0.029)	0.006 (0.046)	0.001 (0.004)	0.090 (0.089)	0.002 (0.004)	0.143 (0.094)
Sales	--	-0.005 (0.007)	--	-0.007 (0.007)	--	-0.001 (0.012)	--	0.003 (0.012)
Sales growth	--	-0.0027 (0.005)	--	-0.005 (0.005)	--	-0.009 (0.009)	--	-0.004 (0.010)
Leverage	--	-0.0020 (0.0044)	--	-0.001 (0.0047)	--	0.003 (0.008)	--	0.000 (0.009)
Net acc. payable	--	0.0105 (0.022)	--	0.003 (0.022)	--	0.008 (0.040)	--	0.003 (0.041)
Bank debt	--	-0.043* (0.024)	--	-0.042* (0.024)	--	-0.126** (0.048)	--	-0.086* (0.050)
Constant	-2.55*** (0.244)	-2.88*** (0.368)	-2.93*** (0.306)	-3.41*** (0.432)	0.18*** (0.047)	0.09 (0.150)	0.21*** (0.049)	0.14 (0.158)
Controls								
Region	yes	yes	yes	yes	yes	yes	yes	yes
Industry	yes	yes	yes	yes	yes	yes	yes	yes
Time	yes	yes	yes	yes	yes	yes	yes	yes
Region*Time	no	no	yes	yes	no	no	yes	yes
Industry*Time	no	no	yes	yes	no	no	yes	yes
Mundlak	yes	yes	yes	yes	--	--	--	--
Firm FE	--	--	--	--	yes	yes	yes	yes
Observations	23,932	14,318	23,932	14,318	55,441	15,327	51,688	14,318
Pseudo R2	0.757	0.765	0.768	0.776	--	--	--	--
R2	--	--	--	--	0.059	0.042	0.073	0.066

Notes: RE-probit models with Mundlak correction (marginal effects in columns 1-4) and linear probability models with firm and time fixed effects (estimates and marginal effects in columns 5-8). The dependent variable is the extensive margin of export (Export), a dummy variable identifying exporting companies. Datasource: yearly balance-sheet data (Cribis D&B) and MET surveys 2008, 2009, 2011, 2013, and 2015. All measures are defined in Appendix. *, **, *** denote, respectively, significance at 10%, 5%, and 1% level. Robust standard errors in parentheses.

Once purged the model from persistent heterogeneity across firms, the role of productivity in fostering export activity is found to be strongly reduced. This result is unchanged across the two estimators and is qualitatively similar if we employ TFP as an alternative measure of productivity (Levinsohn and Petrin, 2003). Notice that the comparison of Table D.1 and D.2, is implicitly confirming the self-selection hypothesis (largely emphasised by the literature), whereby persistently-more-productive companies are self-selecting into international markets, driving the positive association in Table D.1. However, once this persistent heterogeneity is accounted for, the effect of productivity tends to be small or even insignificant. Because columns 1-to-4 of Table D.2 include the Mundlak correction, the estimates have to be interpreted as effects of changes in each measure from

its time average. In other words, the model is purged from any persistent characteristic, including any high/low level of productivity that is stable over time. Once accounted for this issue, and directly controlled for other structural and strategic determinants, the *variation in firms' productivity* (on average) is not sufficient to explain the *change* in their *exporting status*. On the one hand, this is because productivity tends to be quite sticky over time. On the other, most of the variation of productivity in the short run are caused by the strategies undertaken by the company and its operating environment, which are added as separate regressors in our specification as they represent the drivers of productivity and implementable objectives for policy. The insignificance of the estimates implies that the remaining component has not enough variation to induce any change in the international attitude.

This result is largely confirmed by the linear probability models in columns 5-to-8 (especially in the richest specifications), that do not impose any restriction on the type of unobserved heterogeneity that takes place. Notice that this finding has not to be interpreted as an evidence that productivity does not play any role in firms' exporting status. The significant effect documented in Table D.1 suggests a clear positive association between productivity and export. The insignificance portrayed in Table D.2 is exclusively indicating that most of the effect is due to a self-selection of persistently-more-productive companies into the international environment rather than variations in the level of productivity (not driven by dynamic strategies) causing a change in the export propensity.

This interpretation is confirmed in Table D.3 where we model a firm's entry in the international markets by focusing on the sample of previously-non-exporting companies. This result suggests that the productivity premium of internationalized companies is mainly confined to firms that are persistently operating in the international markets. Vice versa, because of the stickiness of the productivity dynamic, changes in productivity do not seem to be capable of explaining a firm's entry choice once persistent heterogeneity is purged by the model.

Table D.3: Probability of export: previously non-exporting companies

	Y:		Export	
	(1)	(2)	(3)	(4)
Innovation	0.022*** (0.007)	0.022*** (0.006)	0.023*** (0.007)	0.019*** (0.006)
R&D share	0.002*** (0.001)	0.002*** (0.001)	0.002*** (0.001)	0.003*** (0.001)
Investment	0.0121* (0.007)	0.008 (0.006)	0.010 (0.006)	0.009 (0.006)
Productivity	0.0011 (0.002)	0.010** (0.004)	0.002 (0.002)	0.006 (0.004)
Size	0.018*** (0.004)	0.018*** (0.005)	0.019*** (0.004)	0.015*** (0.005)
Age	-0.003 (0.004)	-0.001 (0.004)	-0.002 (0.004)	0.001 (0.004)
Import	0.099*** (0.006)	0.321*** (0.011)	0.102*** (0.006)	0.310*** (0.011)
Constant	-1.806*** (0.323)	-0.197*** (0.052)	-1.451*** (0.422)	-0.171*** (0.053)
Controls				
Region	yes	yes	yes	yes
Industry	yes	yes	yes	yes
Time	yes	yes	yes	yes
Region*Time	no	no	yes	yes
Industry*Time	no	no	yes	yes
Mundlak	yes	--	yes	--
Firm FE	--	yes	--	yes
Observations	11,599	32,889	11,599	30,540
Pseudo R2	0.554	--	0.582	--
R2	--	0.124	--	0.164

Notes: RE-probit models with Mundlak correction (marginal effects in columns 1 and 3), and linear probability models with firm and time fixed effects (estimates and marginal effects in columns 2 and 4). The dependent variable is the extensive margin of export (Export), a dummy variable identifying exporting companies. Datasource: yearly balance-sheet data (Cribis D&B) and MET surveys 2008, 2009, 2011, 2013, and 2015. Additional regressors (untabulated) follow the specification in Table D.1. All measures are defined in Appendix. *, **, *** denote, respectively, significance at 10%, 5%, and 1% level. Robust standard errors in parentheses.

Noticeably, firms' dynamic strategies keep playing a critical role in their international propensity. The introduction of innovations, the involvement in R&D projects, and firms' investments have a positive, large, and significant effect on the probability of export even if the persistent heterogeneity across firms is properly accounted for in Table D.2 (roughly 2%-higher probability for the introduction of innovations and investments). This is confirmed in Table D.3, showing that a firm's innovativeness significantly increases its probability to start exporting. Notice that the (apparently small) coefficient of R&D has to be interpreted as the effect of a 1%-increase in the expenditure in R&D. For instance, a firm increasing R&D expenditure up to 10% of its total sales has a 3%-higher probability of exporting.

Other estimates are largely insignificant, suggesting that the results of Table D.1 were mostly driven by persistent differences or sticky characteristics that do not vary over time and may be spuriously associated to unobserved factors. This is the case for profitability measures and indicators of vertical integration that tend to be quite smoothed across consecutive years. On the other hand, financial issues (also quite persistent) are likely to have indirect effects through firms' investment strategies; this issue will be further explored in the upcoming analyses. Finally, the insignificance of the variable Human capital is also likely to come from the explicit control for R&D, which is capturing most of its positive effect.

Table D.4 explores heterogeneity along the (maximum) geographical extension of the destination market. To this end, we run two distinct regressions, one for a firm's probability of exporting within the EU area (Export(EU)), and the other for exporting beyond the Euro zone. The two sets of results confirm the critical role played by firms' strategy in affecting their exporting status. Interestingly, the effect of innovation is found to be way more important for farer markets, with a magnitude that is roughly twice as much as the impact for export activity within the Euro zone. On the other hand, the effect of R&D seems to be somewhat reduced.

Table D.4: Probability of export by geographical extension

	Y: Export(EU) (1)	Export(extraEU) (2)
Innovation	0.010*** (0.002)	0.021*** (0.002)
R&D share	0.002*** (0.000)	0.001*** (0.000)
Investment	0.007*** (0.002)	0.005** (0.002)
Constant	-3.040*** (0.212)	-2.068*** (0.213)
Controls		
Region	yes	yes
Industry	yes	yes
Time	yes	yes
Region*Time	yes	yes
Industry*Time	yes	yes
Mundlak	yes	yes
Observations	14,318	14,318
Pseudo R2	0.795	0.749

Notes: RE-probit models with Mundlak correction (marginal effects). The dependent variable is the extensive margin of export by maximum geographical extension. Export(EU) is a dummy variable identifying companies exporting (at most) in the EU area, while Export(extraEU) is a dummy variable identifying companies exporting in farer countries. The two dependent variables are defined to be mutually exclusive. Datasource: yearly balance-sheet data (Cribis D&B) and MET surveys 2008, 2009, 2011, 2013, and 2015. Additional regressors (untabulated) follow the specification in Table D.1. All measures are defined in Appendix. *, **, *** denote, respectively, significance at 10%, 5%, and 1% level. Robust standard errors in parentheses.

Given the prominent role played by firms' dynamic strategies, in Table D.5 we ask whether, on the top of their direct impact, the upgrading/downgrading paths of a firm have additional effects on its international attitude. In other words, two identical companies having the same set of dynamic strategies, may differ in terms of international propensity depending on *the pattern* undertaken in the recent past (i.e., stable, increasing, or decreasing number of dynamic activities). To this end, we enrich

the baseline specification of Table D.2 with the change in the number of dynamic strategies (innovation, R&D, and investment) between t-2 and t-1. This measure (Upgrading) takes positive values if the company incremented its array of dynamic behaviours, is zero if the firm experienced constant strategies, and takes negative values in case of a reduction in the number of dynamic activities (i.e., downgrading).

Table D.5: Upgrading dynamic strategies

	Y:		Export		
	Estimator:	RE-Probit with Mundlak		Linear probability model	
		(1)	(2)	(3)	(4)
Upgrading	0.046*** (0.004)	0.048*** (0.004)	0.078*** (0.007)	0.075*** (0.007)	
Innovation	0.0396*** (0.006)	0.0441*** (0.006)	0.063*** (0.010)	0.062*** (0.011)	
R&D share	0.002*** (0.000)	0.002*** (0.000)	0.004*** (0.001)	0.004*** (0.001)	
Investment	0.016*** (0.005)	0.016*** (0.005)	0.023** (0.010)	0.023** (0.010)	
Productivity	0.001 (0.002)	0.002 (0.002)	0.010 (0.011)	0.007 (0.011)	
Constant	-3.050*** (0.373)	-3.619*** (0.439)	0.061 (0.149)	0.115 (0.157)	
Controls					
Region	yes	yes	yes	yes	
Industry	yes	yes	yes	yes	
Time	yes	yes	yes	yes	
Region*Time	no	yes	no	yes	
Industry*Time	no	yes	no	yes	
Mundlak	yes	yes	--	--	
Firm FE	--	--	yes	yes	
Observations	14,318	14,318	14,318	14,318	
Pseudo R2	0.771	0.783	--	--	
R2	--	--	0.055	0.077	

Notes: RE-probit models with Mundlak correction (marginal effects in columns 1 and 2) and linear probability models with firm and time fixed effects (estimates and marginal effects in columns 3 and 4). Upgrading is the change in the number of dynamic strategies (Innovation, R&D, and Investment) between t-2 and t-1, with the support [-3,+3]. The dependent variable is the extensive margin of export (Export), a dummy variable identifying exporting companies. Datasource: yearly balance-sheet data (Cribis D&B) and MET surveys 2008, 2009, 2011, 2013, and 2015. All measures are defined in Appendix. *, **, *** denote, respectively, significance at 10%, 5%, and 1% level. Robust standard errors in parentheses.

Results clearly show that, on the top of the positive effects of innovation, R&D, and investment, the path of dynamic strategies undertaken in the recent past has significant effects. In particular, integrating more and more strategies is associated with a positive premium leading to a higher probability of export (ranging between 4% and 8%). On the other hand, the same coefficient suggests that a reduction in the array of dynamic behaviours tends to lower firms' likelihood of exporting. Notice that these results highlight disproportionate benefits for firms that in the past presented low or reduced innovativeness. For this set of companies, the introduction of one or more dynamic activities would allow to (partially) fill the gap with the group of most dynamic firms.

Table D.6 replicates the analysis in table D.2 by providing a breakdown for product, process, and organisational-managerial innovations to explore some heterogeneities along the type of improvement introduced. As expected, product innovations dominate other forms of innovativeness (process or organisational-managerial innovations). This strict dominance is partly related to the fact that new products are the main form of innovation which is not reflected in the level of productivity (which we control for). Importantly, the comparison of column 1 and 3 (or 2 and 4), shows that the impact of product innovations is especially relevant for new exporters (columns 3 and 4), with a magnitude that is roughly twice the impact on the entire sample (4%-increase in the probability to start exporting).

Table D.6: Probability of export: heterogeneities by innovation type

Y: Sample:	Export			
	(1)	(2)	(3)	(4)
R&D share	0.002*** (0.000)	0.004*** (0.000)	0.002*** (0.000)	0.003*** (0.001)
Product inn.	0.0121*** (0.003)	0.020*** (0.006)	0.021*** (0.005)	0.040*** (0.008)
Process inn.	0.007* (0.004)	0.014* (0.007)	0.007 (0.006)	0.005 (0.009)
Organiz. inn.	0.006* (0.003)	0.013** (0.006)	0.009* (0.005)	0.007 (0.007)
Constant	-3.023*** (0.192)	0.227*** (0.049)	-1.623*** (0.270)	-0.167*** (0.053)
Controls				
Region	yes	yes	yes	yes
Industry	yes	yes	yes	yes
Time	yes	yes	yes	yes
Region*Time	yes	yes	yes	yes
Industry*Time	yes	yes	yes	yes
Mundlak	yes	--	yes	--
Firm FE	--	yes	--	yes
Observations	56,955	57,375	30,301	37,370
Pseudo R2	0.762	--	0.551	--
R-squared	--	0.033	--	0.144

Notes: RE-probit models with Mundlak correction (marginal effects in columns 1 and 4) and linear probability models with firm and time fixed effects (estimates and marginal effects in columns 2 and 4). The dependent variable is the extensive margin of export (Export), a dummy variable identifying exporting companies. The left panel reports estimates performed on the entire sample, while the right panel refers to the subsample of previously-non-exporting companies in t-1. Datasource: yearly balance-sheet data (Cribis D&B) and MET surveys 2008, 2009, 2011, 2013, and 2015. Additional regressors (untabulated) follow the specification in Table D.1. All measures are defined in Appendix. *, **, *** denote, respectively, significance at 10%, 5%, and 1% level. Robust standard errors in parentheses.

Notice, however, that on the top of its direct effect on export, a firm's innovativeness may also have indirect effects by boosting firms' productivity, especially process and organisational innovations. To explore this additional channel Table D.7 analyses this indirect effect by testing the role of innovations on firm productivity growth. Columns 1 and 2 present the results from within estimators with firm and time fixed effects. As expected, higher innovativeness is linked to more pronounced productivity growth (+4% growth rate) that may, in turn, further foster a firm's probability of export. Interestingly, this indirect effect is largely driven by less radical forms of improvements such as process and organisational-managerial innovations (column 2), while the introduction of new products does not seem to be linked to any productivity growth (i.e., they only induce direct effects documented in table D.6).

To deal with the possible reverse causality affecting the estimates, we also take advantage of matching techniques in columns 3 and 4. We employ Coarsened Exact Matching to recover a subsample of firms with similar characteristics (size, age, geographical location, industrial features, and, especially, with the same productivity at the beginning of the sample, 2008) that only differ for the actual introduction of innovations (the treatment variable). We then re-estimate the regressions in columns 1 and 2 on the new (balanced) sample employing matching weights. Once again, firms' innovativeness is found to have a positive and significant effect on their productivity growth, with a dominant role for process and organisational-managerial innovations (associated to a 15%-higher productivity growth).

Noticeably, import choices significantly affect productivity growth too. This evidence is largely in line with the empirical and theoretical literature, suggesting that productivity gains from importing intermediates may allow some importers to start exporting, leading to a resource reallocation along the intensive margin (Amiti and Konings, 2005; Halpern, Korn, and Szeidl, 2015; Kasahara and Rodrigue, 2005; Kasahara and Lapham, 2013).

Table D.7: Indirect effect of innovation on productivity

Y:	Productivity growth			
	Estimator:	Within estimator		Matching & Within estimator
	(1)	(2)	(3)	(4)
Innovation	0.041** (0.019)	--	0.233*** (0.037)	--
Product inn.	--	0.011 (0.016)	--	0.066 (0.049)
Process inn.	--	0.018* (0.007)	--	0.155*** (0.059)
Organiz. inn.	--	0.022** (0.007)	--	0.133** (0.056)
Import	0.023** (0.009)	0.022** (0.009)	0.321*** (0.038)	0.328*** (0.038)
Constant	-0.117 (0.101)	-0.117 (0.101)	10.476*** (0.019)	10.491*** (0.019)
Controls				
Region	yes	yes	yes	yes
Industry	yes	yes	yes	yes
Time	yes	yes	yes	yes
Firm FE	yes	yes	yes	yes
Matching & weights	--	--	yes	yes
Observations	13,827	13,827	5,519	5,519
R-squared	0.033	0.034	0.021	0.023

Notes: Within estimator with firm and time fixed effects (estimates and marginal effects). The dependent variable is the growth rate of productivity (value added per worker). In columns 3 and 4 the analysis is performed after matching techniques (Coarsened Exact Matching) identifying a subsample of companies with the same characteristics (size, age, ex ante productivity, region, sector, ...) that only differ for the actual introduction of innovations (the treatment variable). Estimates in columns 3 and 4 are performed employing the matching weights. Datasource: yearly balance-sheet data (Cribis D&B) and MET surveys 2008, 2009, 2011, 2013, and 2015. Additional regressors (untabulated) follow the specification in Table D.1. All measures are defined in Appendix. *, **, *** denote, respectively, significance at 10%, 5%, and 1% level. Robust standard errors in parentheses.

The analysis presented so far, despite providing clear indications on the role of dynamic strategies for firms' internationalisation patterns, misses to acknowledge two important issues. The first one has to do with the simultaneity of the innovation and export decisions. While we always match current export activity with lagged innovative choices, there is still the possibility of significant correlation between the two equations that may invalidate the coefficients of interest. For instance, firms may choose to invest in innovations to penetrate international markets. If this is the case, the two choices are simultaneously determined and this issue should be properly accounted for. The second point has to deal with the identification of the determinants of firms' innovative strategies, which are especially useful to provide some policy guidance.

To this aim, we account for the simultaneity of the phenomena by employing bivariate probit models (with Mundlak correction). The specification estimates firms' probability of exporting conditionally on its (lagged) innovative status. The model can be summarized by the following system of equations:

$$\begin{cases} \text{Export}_{it} = 1 \text{ if } \text{Export}_{it}^* = \theta \text{Innovation}_{it-1} + \beta_1^T X_{1it-1} + \varepsilon_{1it} > 0 \\ \text{Export}_{it} = 0 \text{ if } \text{Export}_{it}^* = \theta \text{Innovation}_{it-1} + \beta_1^T X_{1it-1} + \varepsilon_{1it} \leq 0 \end{cases}$$

$$\begin{cases} \text{Innovation}_{it-1} = 1 \text{ if } \text{Innovation}_{it-1}^* = \beta_2^T X_{2it-2} + \varepsilon_{2it-1} > 0 \\ \text{Innovation}_{it-1} = 0 \text{ if } \text{Innovation}_{it-1}^* = \beta_2^T X_{2it-2} + \varepsilon_{2it-1} \leq 0 \end{cases}$$

where Export_{it} and Innovation_{it-1} are the observed (dummy) dependent variables, Export_{it}^* and $\text{Innovation}_{it-1}^*$ are latent variables, while ε_{1it} and ε_{2it-1} are the two error terms, assumed to be *i.i.d.* as a bivariate normal with unitary variance and correlation coefficient $\rho = \text{corr}(\varepsilon_1, \varepsilon_2)$. The system of equations allows to estimate the impact of innovativeness on export, and to jointly analyse the

drivers of innovative strategies. X_{1it-1} is the standard set of regressors in Table D.2, while X_{2it-2} is a vector of determinants for innovations, including R&D choices (internal vs outsourcing), structural characteristics (size, age, capitalisation, and productivity), proxies for demand conditions (past sales growth), operating environment (group belonging and participation in local networks), as well as measures aimed at capturing firms' financial conditions.

Table D.8.A presents the main results. First, even after accounting for the simultaneity of the phenomena, and perfectly controlling for third factors that jointly affect export and innovation, firms' innovative strategies are found to have strong and significant effects on their international propensity. In other words, the main results of the previous analyses are found to be robust and not to depend on simultaneity issues.

The analysis on the determinants of firms' innovativeness present interesting results. As expected, structural characteristics are significantly affecting the introduction of innovations, especially in case of larger, younger, and more productive companies. Similarly, past sales growth, which can be thought of as a proxy for demand trends, is positively associated to firms' innovativeness. The existence of R&D projects is clearly correlated to huge increases in the probability of introducing innovations. Importantly, this effect is not limited to the investment in R&D performed within the firm (internal R&D), but extends to firms outsourcing R&D activities, even though with smaller magnitudes (+8% vs. +27% probability). This is a relevant result, as the outsourcing of R&D projects is widely employed by very small firms that are not structured enough to undertake internal research projects.³⁸ Another important factor in driving firms' innovativeness is related to the operating environment of a firm. Belonging to a corporate group significantly increases the probability of innovating by roughly 5%, as well as the insertion into domestic networks with other companies (4.5%). This result is largely in line with the dominant literature on domestic districts, whereby close proximity with other companies may foster the innovative process through iterated exchanges of knowledge flows. Notice that, once again, the insignificance of Human capital may be driven by its persistence (we always account for Mundlak correction) as well as controls for R&D capturing most of its effect.

Finally, columns 1 and 2 emphasise the critical role played by financial constraints in the development of innovative projects. By their very own nature, innovative firms, especially SMEs, are more likely to suffer from financial problems. Because of their informational opaqueness, their little tangible assets to pledge as collateral, and the riskiness of their strategies, most potentially-innovative firms are credit-rationed and face relevant obstacles in financing their investments. In this regard, the type of innovation to be financed, the characteristics of the firm, and its relationship with the lender bank play a crucial role in the actual capability of introducing innovations.

We analyse this effect in two alternative ways. In column 1, we employ a synthetic measure of firms' creditworthiness (or bankability), defined as the first principal component (Creditworthiness) of several financial ratios that are traditionally used by banks to compute internal credit scores (leverage, ability to pledge collateral, age, size, cash flow to total assets ratio, sales to total assets ratio, proxies for rollover risk, ...).³⁹ As expected, this measure is positively associated to firms' innovativeness, possibly because of its correlation with firm access to external credit.

³⁸ Notice that the variable Human capital is largely insignificant, possibly because R&D measures are capturing most of its effect.

³⁹ The first principal component accounts for 65% of the total variance and loads on all the coefficients unambiguously indicating increases in creditworthiness.

Table D.8.A: Innovation and export: simultaneous equation model

	(1)	(2)
Export equation:		
Innovation	0.493*** (0.020)	0.504*** (0.019)
R&D	0.003*** (0.000)	0.002*** (0.000)
Investment	0.029*** (0.007)	0.022*** (0.007)
Innovation equation:		
External R&D	0.061*** (0.011)	0.082*** (0.012)
Internal R&D	0.247*** (0.009)	0.273*** (0.010)
Creditworthiness	0.016*** (0.005)	-- --
Prob (financial constraints)	--	-0.419*** (0.167)
Human capital	0.008 (0.017)	0.023 (0.017)
Size	0.027*** (0.003)	0.027*** (0.003)
Productivity	0.013*** (0.003)	0.0115*** (0.003)
Capitalisation	-0.001 (0.001)	0.001 (0.001)
Age	-0.008** (0.003)	-0.0259*** (0.005)
Sales growth	0.018** (0.008)	0.021** (0.008)
Local network	0.045*** (0.006)	0.040*** (0.006)
Group	0.050*** (0.008)	0.044*** (0.009)
Controls		
Region	yes	yes
Industry	yes	yes
Time	yes	yes
Mundlak	yes	yes
Observations	20,684	20,684
Rho	-0.641***	-0.641***

Notes: bivariate probit models with Mundlak correction (marginal effects). The top panel reports estimates from the export equation (untabulated regressors follow the specification in Table D.1). The bottom panel presents the innovation equation. External and Internal R&D are dummy variables identifying companies outsourcing R&D or performing R&D internally. Creditworthiness is a synthetic proxy for firms' creditworthiness computed as the first principal component of several financial characteristics that may affect a bank's decision to lend (leverage, collateral availability, size, rollover risk, age). Prob(financial constraints) is the predicted probability of being financially constrained as computed in the following table (D.8.B). Rho is the estimated correlation of the error terms of the two equations. Datasource: yearly balance-sheet data (Cribis D&B) and MET surveys 2008, 2009, 2011, 2013, and 2015. All measures are defined in Appendix. *, **, *** denote, respectively, significance at 10%, 5%, and 1% level. Robust standard errors in parentheses.

As an alternative measure, column 2 employs the predicted probability of being financially constrained. In particular, the MET survey contains information on the existence of positive net-present-value investment projects that were not undertaken because of a lack of financial means. This measure can be thought of as a direct proxy for financial constraints (dummy variable) and is employed in Table D.8.B as a dependent variable.

On the top of some structural characteristics, we employ a set of measures that are traditionally used by the literature as proxies for relationship lending. Relationship lending represents the informational privilege that a bank accumulates over time by establishing close ties with its borrower so to overcome problems of informational asymmetry, especially when dealing with innovative projects. The amount of soft information gathered by banks can be critical in determining credit access, especially for opaque SMEs whose hard information is not enough to correctly evaluate firm

creditworthiness. In other words, the existence of close ties with the lender bank significantly helps overcoming credit constraints.

Given the unobservability of the stock of prior information accumulated by the bank, we employ three main measures to capture this phenomenon. The first one, Bank distance, is the physical distance between the belonging province of a company and the headquarter of the lending bank (in log-Km). This measure is correlated with the “informational distance” between the lender and the borrower; the larger the distance, the higher banks’ difficulties in transmitting soft information to the headquarters. Similarly, banks’ degree of hierarchisation (here proxied by Bank size, i.e., the log of banks’ total assets) significantly affects the transmission of soft information gathered from delocalized branches to the upper levels. Finally, the higher the number of banks each firm is borrowing from, the weaker the relationship that is established with the lender, and the lower the amount of soft information that is allegedly gathered.

Table D.8.B presents results that are in line with a priori expectations and emphasise the critical role played by relationship lending in reducing a firm’s probability of being financially constrained. Finally, in column 2 of Table D.8.A we employ the predicted probability from Table D.8.B to show the detrimental effect of financial constraints on firms’ innovativeness, which is always very negative and extremely significant, suggesting that finance may represent a severe obstacle for financing innovative activities of SMEs.

Table D.8.B: Probability of being financially constrained

	Y: Financial Constraints (1)
Age	-0.032*** (0.001)
Size	-0.015*** (0.002)
Bank distance	0.0104*** (0.000)
Bank size	0.002** (0.001)
N banking relationships	0.003*** (0.001)
Observations	73,865
Pseudo R2	0.122

Notes: Probit model (marginal effects, in units of standard deviations in columns 1-2). The dependent variable is a direct measure of financial constraints (self reported) identifying firms having positive net-present-value projects that were not undertaken because of a lack of financial resources. Bank distance is the physical distance (log-Km) between the belonging province of a firm and the headquarter of its lending bank (in case of multiple banking relationships, an average has been applied). Bank size is the log of total assets of the lending bank. N banking relationships is the number of banking relationships in place. Datasource: yearly balance-sheet data (Cribis D&B) and MET surveys 2008, 2009, 2011, 2013, and 2015. All measures are defined in Appendix. *, **, *** denote, respectively, significance at 10%, 5%, and 1% level. Robust standard errors in parentheses.

Before moving to the analysis of the intensive margins of export, it is worth providing some evidence on firms’ exit. Because of the sensible drop in domestic demand, a large fraction of companies entered the international environment in the aftermath of 2011. At the same time, Table C.9 showed a significant outflow of firms within the same period. Table D.9 digs deeper into this issue by modelling a firm’s probability of exiting the international market after 2011. These firms tend to be on average smaller, younger, and, especially, less productive. Notice that while after accounting for unobserved heterogeneity firms’ productivity did not play any role in firms’ entrance, it keeps having a very negative and significant effect on exit strategies (a one-standard deviation increase in productivity is linked to a -1.4% probability of exiting the international markets). These combined results point at and outflow of companies that attempted to succeed in the international environment despite being less structured and fragile. Importantly, the adoption of dynamic strategies, especially innovation and investment, may help overcoming structural characteristics by significantly lowering a firm’s probability of exit (-8.5% and -4.7%, respectively).

Table D.9: Firms' exit after 2011

	Y:	Exit
	(1)	(2)
Innovation	--	-0.085***
	--	(0.011)
R&D share	--	-0.001
	--	(0.001)
Investment	--	-0.047***
	--	(0.010)
Productivity	-0.014**	-0.012**
	(0.004)	(0.005)
Size	-0.056***	-0.043***
	(0.002)	(0.003)
Age	-0.014***	-0.015**
	(0.004)	(0.006)
Import	-0.0208***	-0.193***
	(0.012)	(0.014)
Constant	-1.806***	-0.197***
	(0.323)	(0.052)
Controls		
Region	yes	yes
Industry	yes	yes
Time	yes	yes
Region*Time	no	no
Industry*Time	no	no
Mundlak	yes	yes
Observations	4,951	4,951
Pseudo R2	0.540	0.541

Notes: RE-probit models with Mundlak correction (marginal effects). The dependent variable is a dummy measure identifying firms exiting the international markets after 2011 (Exit). Datasource: yearly balance-sheet data (Cribis D&B) and MET surveys 2011, 2013, and 2015. Additional regressors (untabulated) follow the specification in Table D.1. All measures are defined in Appendix. *, **, *** denote, respectively, significance at 10%, 5%, and 1% level. Robust standard errors in parentheses.

6.3 INTENSIVE MARGINS AND EXTENSIONS

Table D.10 presents the result for the intensive margins of export, which is captured with two different measures. The first one is the share of sales from exported products (as a percentage of total sales, in columns 1 and 2), which, however, may provide unclear indications in case of relevant shocks to the domestic demand (i.e., this measure may increase for companies that keep exporting the same value while reducing at the same time the overall domestic sales). To overcome this drawback we also present results on the growth rate of export sales (in columns 3 and 4) as an alternative proxy.

While accounting for unobserved heterogeneity made productivity irrelevant in determining a firm's probability of export, productivity plays a critical role for the intensive margins. Increasing productivity allows firms to better compete on the international markets, resulting into increasing share of exported products and positive trends in export growth (a one-standard-deviation increase in productivity leads to a 4%-increase in the growth rate of exported products).

Importantly, the effect of firms' innovativeness on export is not limited to the extensive margins, but extends to the performance on the international markets, causing a 8.3%-increase in export growth. Once again, columns 2 and 4 show a strict dominance of product innovations compared to alternative forms of improvements.

Table D.10: Intensive margins of export

Y:	Export share		Export sales growth	
	(1)	(2)	(3)	(4)
Productivity	0.450*** (0.131)	0.454*** (0.131)	0.038** (0.018)	0.038** (0.018)
Size	1.255*** (0.157)	1.258*** (0.157)	0.035 (0.024)	0.035 (0.024)
Age	-0.095 (0.102)	-0.098 (0.102)	-0.049*** (0.014)	-0.049*** (0.014)
R&D share	0.107*** (0.016)	0.102*** (0.016)	0.007*** (0.001)	0.007*** (0.001)
Innovation	0.584*** (0.187)	--	0.083*** (0.019)	--
Product inn.	--	0.956*** (0.235)	--	0.061*** (0.023)
Process inn.	--	0.028 (0.262)	--	0.012 (0.026)
Organiz. inn.	--	0.408* (0.223)	--	0.040* (0.023)
Export sales	--	--	-0.434*** (0.013)	-0.434*** (0.013)
Constant	4.701*** (1.778)	4.541** (1.778)	7.213*** (0.571)	7.211*** (0.572)
Controls				
Region	yes	yes	yes	yes
Industry	yes	yes	yes	yes
Time	yes	yes	yes	yes
Region*Time	yes	yes	yes	yes
Industry*Time	yes	yes	yes	yes
Firm FE	yes	yes	yes	yes
Observations	67,108	67,108	16,954	16,954
R2	0.008	0.009	0.184	0.184

Notes: within estimators with firm and time fixed effects (estimates and marginal effects). The dependent variable is the intensive margin of export defined as the share of exported sales on total turnover (Export share in columns, 1 and 2) or as the growth rate of exported value (Export sales growth, in columns 3 and 4). Datasource: yearly balance-sheet data (Cribis D&B) and MET surveys 2008, 2009, 2011, 2013, and 2015. Additional regressors (untabulated) follow the specification in Table D.1. All measures are defined in Appendix. *, **, *** denote, respectively, significance at 10%, 5%, and 1% level. Robust standard errors in parentheses.

Importantly, the effect of dynamic strategies on extensive and intensive margins of export tend to be multiplicative. Table D.11 shows the differential impact of innovation on export depending on whether or not the firm paired the improvement with investment in R&D activities. The analysis sheds light on significant heterogeneities based on the differential degree of innovativeness embedded

in the new products or processes developed. Innovation strategies that are combined with R&D projects increase a firm's probability of exporting twice as much as the introduction of less radical innovations (4% vs 1.7%). In the same vein, they increase the growth rate of exported value by roughly 12%, compared to the 6.6% of innovation without R&D. Notice that these effects are always over and above the mere effect of R&D (which is controlled for in any regression). Given the large diffusion of the phenomenon of "innovation without R&D" in Italy, this result identifies a set of suitable targets for industrial policies by pointing at the importance of pushing companies to integrate innovation strategies with R&D activities in order to improve international performances.

Table D.11: Cumulative effects of dynamic strategies: innovation with or without R&D

Y:	Export				Export sales growth Within estimator
	Estimator:	RE-Probit with Mundlak		Linear probability model	
	(1)	(2)	(3)	(4)	(5)
Innovation with R&D	0.036*** (0.004)	0.041*** (0.007)	0.055*** (0.009)	0.055*** (0.013)	0.117*** (0.027)
Innovation without R&D	0.010*** (0.003)	0.017*** (0.004)	0.017*** (0.006)	0.025*** (0.006)	0.066*** (0.021)
R&D share	0.002*** (0.000)	0.002*** (0.000)	0.003*** (0.000)	0.003*** (0.001)	0.006*** (0.002)
Productivity	0.001 (0.001)	0.002 (0.001)	0.004 (0.004)	0.004 (0.004)	0.038** (0.018)
Constant	-3.021*** (0.193)	-1.657*** (0.270)	0.228*** (0.049)	-0.169*** (0.053)	7.214*** (0.571)
Controls					
Region	yes	yes	yes	yes	yes
Industry	yes	yes	yes	yes	yes
Time	yes	yes	yes	yes	yes
Region*Time	no	yes	no	yes	yes
Industry*Time	no	yes	no	yes	yes
Mundlak	yes	yes	--	--	--
Firm FE	--	--	yes	yes	yes
Observations	56,955	30,301	57,375	37,370	16,954
Pseudo R2	0.764	0.776	--	--	--
R2	--	--	0.033	0.144	0.184

Notes: RE-probit models with Mundlak correction (marginal effects in columns 1 and 2) and within estimator with firm and time fixed effects (estimates and marginal effects in columns 3, 4, and 5). The dependent variable is the extensive margin of export (Export), a dummy variable identifying exporting companies in columns 1 to 4, or the growth rate of exported value (Export sales growth in column 5). Innovation with or without R&D are dummy variables identifying innovative firms performing or not performing R&D activity. Datasource: yearly balance-sheet data (Cribis D&B) and MET surveys 2008, 2009, 2011, 2013, and 2015. All measures are defined in Appendix. *, **, *** denote, respectively, significance at 10%, 5%, and 1% level. Robust standard errors in parentheses.

Table D.12 presents estimates from quantile regressions on the share of exported products. The analysis aims at shedding light on potential nonlinearities in the effect of firms' innovativeness and other factors on export. In other words, if there are structural differences between marginal exporters and firms exporting a large share of their production, quantile regressions allow testing for these heterogeneities.

Results highlight that research activities are fundamental to improve the performance on foreign markets except in case of firms that are already large exporters. In particular, the positive role played by R&D projects increases along with the degree of dependency from international markets. For large exporters, however, this effect turns out to be low and insignificant, probably due to the fact that highly internationalised firms lean on other types of strategies (e.g. outsourcing, market power exploitation, strict connection with foreign markets) to gain/preserve the competitive advantage over their rivals.

In a similar vein, the introduction of new products/processes/organisational practices is a relevant strategy for companies with a low share of revenues stemming from export activities. Indeed, the estimated coefficients point out that the first half of the export share conditional distribution associated with innovators is shifted rightward with respect to the first half of the conditional distribution associated with non-innovating firms. On the contrary, innovation plays a minor role for

large exporters, probably because these business activities have already reached an established position on foreign markets.

Clearly, large exporters may face tougher competition in some industries, but to further increase the share of exported products innovations seem not to be a critical issue. On the other hand, productivity is a fundamental determinant of the magnitude of the international success, as emphasised by coefficients that are strictly increasing along with the intensive margins. In a similar vein, the number of employees and the share of exported turnover are significantly and positively correlated, with a coefficient that increases (at least until the 90th percentile) along the distribution of intensive margins. In-between the 75th and 90th percentiles the importance of size dwindles in magnitude but not in significance. Moreover the number of employees remain more important for large exporters than for the marginal and small ones.

Overall, then, the estimates of quantile regression suggest that R&D and innovation are fundamental for penetrating foreign markets. Once the firm has reached a significant degree of dependence from the international environment, however, the organisational complexity and efficiency (i.e. size and productivity) stand out as the key elements for further improvements of competitive advantages.

Table D.12: Marginal vs. large exporters

Quantile:	Y: Export share				
	q10 (1)	q25 (2)	q50 (3)	q75 (4)	q90 (5)
R&D	0.047*** (0.009)	0.077*** (0.021)	0.118*** (0.035)	0.174** (0.070)	0.089 (0.084)
Innovation	0.439*** (0.127)	0.467*** (0.151)	0.838*** (0.292)	0.432 (0.508)	0.070 (0.880)
Productivity	0.414*** (0.059)	0.536*** (0.116)	1.906*** (0.214)	2.502*** (0.425)	2.544*** (0.378)
Size	0.869*** (0.066)	1.215*** (0.190)	4.329*** (0.107)	4.651*** (0.296)	3.423*** (0.301)
Constant	-3.488*** (0.685)	0.210 (1.477)	-4.836*** (1.851)	20.253*** (5.256)	54.684*** (4.880)
Controls					
Region	yes	yes	yes	yes	yes
Industry	yes	yes	yes	yes	yes
Time	yes	yes	yes	yes	yes
Region*Time	yes	yes	yes	yes	yes
Industry*Time	yes	yes	yes	yes	yes
Mundlak	yes	yes	yes	yes	yes
Observations	28,016	28,016	28,016	28,016	28,016

Notes: quantile regressions with Mundlak correction (estimates). The dependent variable is the intensive margin of export defined as the share of exported sales on total turnover (Export share). The estimation is performed on the subsample of exporters only. Datasource: yearly balance-sheet data (Cribis D&B) and MET surveys 2008, 2009, 2011, 2013, and 2015. Additional regressors (untabulated) follow the specification in Table D.1. All measures are defined in Appendix. *, **, *** denote, respectively, significance at 10%, 5%, and 1% level. Robust standard errors in parentheses.

Having established the effect of dynamic strategies on firms' international propensity, we turn the attention to potential non-linearities in the effects of interest. In particular, smaller and less productive firms may have disproportionate benefits from the introduction of innovations and the investment in R&D projects. To test for this heterogeneity, Tables D.13 and D.14 interact the effect of Innovation and R&D with dummy indicators of high and low productivity and large and small size. The thresholds used to identify the companies are listed in the third rows (33rd or 25th percentile of the 2008 cross-sectional distribution of size and productivity).

Table D.13: Disproportionate effects for less productive firms

	Y: Export		Export sales growth	
	Estimator:	RE-Probit with Mundlak	Within estimator	
	Threshold (percentile):	33rd	25th	33rd
	(1)	(2)	(3)	(4)
Innovation*Medium-High productivity	0.017*** (0.003)	0.016*** (0.003)	0.071*** (0.020)	0.080*** (0.020)
R&D share* Medium-High productivity	0.002*** (0.000)	0.002*** (0.000)	0.007*** (0.002)	0.007*** (0.002)
Innovation*Low productivity	0.053*** (0.003)	0.051*** (0.003)	0.175*** (0.035)	0.161*** (0.041)
R&D share*Low productivity	0.004*** (0.000)	0.004*** (0.000)	0.012*** (0.004)	0.011*** (0.004)
Constant	-3.164*** (0.240)	-3.174*** (0.240)	6.992*** (0.588)	6.968*** (0.588)
Controls				
Region	yes	yes	yes	yes
Industry	yes	yes	yes	yes
Time	yes	yes	yes	yes
Region*Time	yes	yes	yes	yes
Industry*Time	yes	yes	yes	yes
Mundlak	yes	yes	--	--
Firm FE	--	--	yes	yes
Observations	37,710	37,710	16,424	16,424
Pseudo R2	0.767	0.767	--	--
R2	--	--	0.206	0.205

Notes: RE-probit models with Mundlak correction (marginal effects in columns 1-2) and within estimator with firm and time fixed effects (estimates and marginal effects in columns 3-4). The dependent variable is the extensive margin of export (Export), a dummy variable identifying exporting companies in columns 1 and 2, or the growth rate of exported value (Export sales growth in columns 3 and 4). Medium-High or Low productivity are dummy variables identifying firms whose ex ante productivity is above or below the threshold (33rd or 25th percentile in columns 1 and 3, or 2 and 4, respectively) of the productivity distribution at the beginning of the sample. Datasource: yearly balance-sheet data (Cribis D&B) and MET surveys 2008, 2009, 2011, 2013, and 2015. All measures are defined in Appendix. *, **, *** denote, respectively, significance at 10%, 5%, and 1% level. Robust standard errors in parentheses.

Table D.14: Disproportionate effects for small firms

	Y: Export		Export sales growth	
	Estimator:	RE-Probit with Mundlak	Within estimator	
	Threshold (percentile):	33rd	25th	33rd
	(1)	(2)	(3)	(4)
Innovation* Medium-Large	0.0124*** (0.003)	0.011*** (0.003)	0.078*** (0.020)	0.089*** (0.019)
R&D share* Medium-Large	0.002*** (0.000)	0.002*** (0.000)	0.007*** (0.002)	0.007*** (0.002)
Innovation*Small	0.0442*** (0.003)	0.0481*** (0.003)	0.219*** (0.049)	0.141** (0.068)
R&D share*Small	0.003*** (0.000)	0.003*** (0.000)	0.024*** (0.007)	0.030*** (0.011)
Constant	-3.115*** (0.212)	-3.110*** (0.212)	7.017*** (0.588)	7.002*** (0.588)
Controls				
Region	yes	yes	yes	yes
Industry	yes	yes	yes	yes
Time	yes	yes	yes	yes
Region*Time	yes	yes	yes	yes
Industry*Time	yes	yes	yes	yes
Mundlak	yes	yes	--	--
Firm FE	--	--	yes	yes
Observations	45,401	45,401	16,424	16,424
Pseudo R2	0.759	0.759	--	--
R2	--	--	0.206	0.205

Notes: RE-probit models with Mundlak correction (estimates in columns 1-2) and within estimator with firm and time fixed effects (estimates and marginal effects in columns 3-4). The dependent variable is the extensive margin of export (Export), a dummy variable identifying exporting companies in columns 1 and 2, or the growth rate of exported value (Export sales growth in columns 3 and 4). Medium-Large or Small are dummy variables identifying firms whose ex ante size is above or below the threshold (33rd or 25th percentile in columns 1 and 3, or 2 and 4, respectively) of the size distribution at the beginning of the sample. Datasource: yearly balance-sheet data (Cribis D&B) and MET surveys 2008, 2009, 2011, 2013, and 2015. All measures are defined in Appendix. *, **, *** denote, respectively, significance at 10%, 5%, and 1% level. Robust standard errors in parentheses.

Both the extensive (columns 1 and 2) and the intensive (columns 3 and 4) margins of export present significant non-linearities pointing at larger benefits for smaller and less productive companies (for instance, innovations of less productive companies are linked to a 5.3% increase in the probability of export and 17%-higher export sales growth, which are reduced to 1.7% and 7.1% in case of innovations undertaken by a productive firm). This is a critical finding as it identifies innovative strategies as a potential tool to fill the gap between large/productive companies and the set of less structured firms, that are ideal targets for policy measures.

Finally, before moving the attention to a focus on global value chains, Table D.15 explores differential performance in the second part of the crisis (after 2011) across persistently internationalized companies and new entrants.

The drop in domestic demand has pushed a second wave of internationalisation for companies that were originally domestic. The self-selection hypothesis emphasises the existence of a productivity gap between long-lasting exporters and the new entrants. This analysis highlights substantial differences in the international performance across the two groups. Table D.15 focuses on exporters only and shows that new entrants experienced significantly lower performance in terms of exported values (the benchmark is the subset of persistently internationalized companies). Column 2 instead shows the overall performance of new entrants and persistently internationalized companies compared to the domestic ones. Interestingly, the entrance in the international markets allowed firms to increase their overall sales by roughly 6.7%, with a growth rate that is significantly larger than the one experienced by companies that were already internationalized (2.2%). This result confirms the relative poor performance of domestic companies, largely affected by the drop in domestic demand, and emphasises the significant role played by international strategies in offsetting the collapse of domestic sales. Moreover, even if new entrants were characterized by lower exported values, their relative higher growth rates of sales indicate a process of catching up if the international strategy is pursued continuously.

Table D.15: Persistent vs. new exporters: differential performance

Y:	ln(exports)	Total sales growth
Sample:	Internationalized	Entire
	(1)	(2)
New entrants	-0.407*** (0.046)	0.067*** (0.020)
Persistently internationalized	-- --	0.022* (0.012)
Constant	2.530*** (0.176)	-0.761*** (0.067)
Controls		
Region	yes	yes
Industry	yes	yes
Time	yes	yes
Region*Time	yes	yes
Industry*Time	yes	yes
Firm FE	yes	yes
Observations	9,627	19,003
R-squared	0.674	0.305

Notes: within estimator with firm and time fixed effects (estimates and marginal effects). The dependent variable is the value of exported products in log n (ln(exports) in column 1) or the growth rate of total sales between the average of 2008-11 and 2012-2015 (Total sales growth in column 2). New entrants is a dummy variable identifying companies that started export activity after 2011 (and were only domestic before). Persistently internationalized is a dummy measure identifying companies that were exporters throughout the entire time span. The sample varies across columns and is indicated in the second row. Datasource: yearly balance-sheet data (Cribis D&B) and MET surveys 2008, 2009, 2011, 2013, and 2015. Additional regressors (untabulated) follow the specification in Table D.1. All measures are defined in Appendix. *, **, *** denote, respectively, significance at 10%, 5%, and 1% level. Robust standard errors in parentheses.

Box 5: Institutional environment

As expected, a critical role is played by the quality of the institutional environment the firm belongs to. Taking advantage of an institutional index developed by Vecchione and Nifo (2014), we exploit province level data and collapse six main dimensions: (i) voice and accountability, (ii) political stability and absence of violence and terrorism, (iii) government effectiveness, (iv) regulatory quality, (v) rule of law, (vi) control and corruption. The resulting synthetic index is then inserted into the main specifications for the extensive and intensive margins of export. The following Table shows the crucial effect of the business environment in affecting firms' both competitiveness and performance. It is worth emphasizing that this effect is over and above the mere effect of regional or industrial components, as well as the other determinants outlined in the previous section.

Institutional quality

	Y: Export (1)	Export sales growth (2)
Institutional Quality	0.514*** (0.066)	0.088*** (0.027)
Constant	-1.280*** (0.072)	-1.293*** (0.073)
Controls		
Region	yes	yes
Industry	yes	yes
Time	yes	yes
Mundlak	yes	no
Firm FE	--	yes
Observations	23,224	16,954
Pseudo R2	0.217	--
R2	--	0.0531

Notes: RE-probit models with Mundlak correction (estimates in column 1) and within estimator with firm and time fixed effects (estimates and partial effects in columns 2). The dependent variable is the extensive margin of export (Export), a dummy variable identifying exporting companies in column 1, or the growth rate of exported value (Export sales growth in column 2). Institutional quality is an institutional quality index based on province-level data as in Vecchione and Nifo (2014). Datasource: yearly balance-sheet data (Cribis D&B) and MET surveys 2008, 2009, 2011, 2013, and 2015. All measures are defined in Appendix. *, **, *** denote, respectively, significance at 10%, 5%, and 1% level. Robust standard errors in parenthesis.

6.4 GLOBAL VALUE CHAINS IN TIMES OF CRISIS

This section aims at providing some insights on the behaviours and performance of participants in global value chains (GVCs) during the recent crisis. We tackle this research question by designing a comprehensive taxonomy of GVC participation modes and exploring their impact on firms' innovativeness and performance.⁴⁰

First, we describe the approach used to identify GVCs and their different forms of governance combining survey data on export, import, type of the main good produced, and involvement in global networks.

Because intermediate products are typically employed in a broader production process, we regard exporters of semi-finished goods and components to be (reasonably) part of a GVC. Similarly, a company importing its inputs and exporting final goods is totally integrated in an international framework and is expected to participate in a production on global scale. A certain degree of ambiguity arises when companies are, to some extent, internationalized; either import input factors or export final products. For this group, we condition a firm's inclusion in GVCs to its involvement in global networks. This information is inferred from an additional question in the MET survey asking about the existence of "long-lasting and significant relationships with foreign companies". Although this definition is not based on an objective scale, it leaves to the firm the evaluation of whether the international linkage is non-occasional and represents an important activity for its own business. This piece of information allows to rule out from our GVC measure firms that occasionally search for new markets and cheaper inputs (roughly 75% of the ambiguous cases).

Because theoretical literature on GVCs has largely stressed that learning opportunities may vary significantly across modes of participation in a value chain, we attempt to explore this heterogeneity by also proposing a taxonomy of the different forms of governance. We group companies involved in GVCs according to the following empirical classification (largely consistent with Humphrey and Schmitz, 2002b; Gereffi et al., 2005).

1. *Arm-length market relationships*. It is the simplest form of governance implying negligible dependence between buyers and suppliers, and involving transactions that are highly codifiable. Because the product exchanged is typically standard, or easily customized, the buyer's requirements can be met by a broad range of firms and there is no need for the development of close relationships among companies in the value chain.
2. *Hierarchical relationships*. This mode of participation in a GVC typically involves in-house production and a high degree of vertical integration. The direct control that the headquarters exert over subordinates in an offshore subsidiary (or affiliate of a vertically integrated firm) implies a maximum degree of subordination for suppliers. Such direct control leads to a high degree of explicit coordination and a relevant power asymmetry in favour of the lead firm.
3. *Quasi-hierarchical relationships*. In this governance mode, buyers exercise great control over other companies in the chain by providing detailed specifications for the product to be produced and the production processes to be followed. Even without any legal form of subordination, there is a strong asymmetry of power relationships in favour of the lead firm committing complex products to low-skill suppliers.
4. *Relational GVCs*. This governance typically arises when complex transactions involve high-skill suppliers producing goods that are not easily codifiable. Companies participating in relational GVCs engage in close inter-firm connections, but because all parties contribute to the definition of the product with key competences, the power balance between firms is more symmetrical than in quasi-hierarchical relationships. Within relational GVCs, the high capability of suppliers provides strong motivations to the lead firms for exchanging knowledge and gaining access to complementary competencies.

⁴⁰ The analysis is largely based on Brancati, et al. 2017 (Journal of Economic Geography, forthcoming).

From an operational standpoint, we classify into the four participation modes by exploiting survey-based information on firms' affiliation to corporate groups, the existence of stable commercial partners, and the degree of participation in the conception of the final product. First, we employ information on the affiliation to corporate groups to capture the high degree of legal subordination characterizing hierarchical GVCs.

The second discriminating factor employed in our classification is the establishment of strong informal ties with other firms. We proxy this dimension with survey information on the existence of stable commercial partners. In particular, our questionnaire explicitly asks if there are long-lasting and significant relationships with foreign companies, and if these links are oriented to trade activities. This piece of data conveys information on whether the international connection is non-occasional and, most importantly, if it involves commercial partners that are critical for a firm's business. We exploit this variable to discriminate forms of governance in which suppliers have weak relationships with multiple customers (arm-length market GVCs), from participation modes characterized by strong informal ties with the main buyer (quasi-hierarchical and relational GVCs). Because their wide customer base implies negligible dependence and weak connections with other firms, we identify arm-length market GVCs as suppliers without any stable and significant commercial partners.

Finally, we use information on firms' involvement in the conception of the final product to proxy for a company's specific skills and participation in the decision process within the value chain. The MET survey asks firms to self-assess their own contribution in planning and defining the characteristics of the final product to be sold, with qualitative answers on a scale from zero (no participation) to three (total control). This dimension allows us to distinguish quasi-hierarchical GVCs --where suppliers passively receive the buyer's specifications--, from relational governance modes in which firms actively contribute to the definition of the product with key competences. Even without any formal control by a lead firm, quasi-hierarchical suppliers are strongly dependent on buyers providing detailed specifications for goods and production processes. In this regard, the existence of relevant commercial networks proxies for their strong dependence and subordination, while the absence of participation in the definition of the final product captures their low capability and marginal involvement in the decision process at the GVC level.

On the other hand, firms are thought to be in relational GVCs if they assess to have relevant commercial partners and to play an active role in the definition of the final good to be produced. These companies engage in close inter-firm connections, but their skills ensure greater autonomy compared to quasi-hierarchical relationships. Differently from the previous form of governance, the active participation in the conception of the final product captures the high capability of suppliers and their relevant involvement in the decision process within the GVC.

The empirical analysis, which cannot be focused on the extensive margins of export because of the very definition of GVCs, employs this classification to explore the effect of GVC belonging on firms' innovativeness (innovation and R&D) and performance (productivity and sales growth).

Column 1 of Table D.16 presents the results for firms' innovativeness. On the top of structural characteristics and behaviours, GVC participation is found to induce a 5.1%-increase in a company's probability of introducing (at least one) product or process innovations. The effect is even higher (6.7%) if we focus on the subsample of non-innovative companies in t-1 to address the possible reverse causality driven by the persistence of the innovation process (column 5). The other controls present coefficients that are in line with a priori expectations, with a predominant role played by firm structural characteristics (especially size), R&D, and degree of internationalisation.

Column 3 presents coherent results for the extensive margins of R&D. Firms involved in GVCs show greater dynamic propensities, translating into a probability of undertaking R&D projects that is 3.4%-higher than other companies; 6.8% in the subsample of firms with no R&D expenditure in t-1 (column 7).

Theoretical literature suggests that the coordination mechanism within a GVC and the learning opportunities of its participants vary considerably across forms of governance.

Column 2 clearly shows an effect of GVC participation on innovation that is highly heterogeneous, translating into a substantial innovative premium for relational GVCs and no significant impact for the other forms of governance. Again, this effect dominates our rich set of controls and is larger for the subsample of previously-non-innovative companies (5.2% in column 6). Column 4 shows consistent results for the investment in R&D: relational GVCs have a 3.7%-higher probability of investing in research activities (5.8% in column 8) while other modes of participation do not display any significant premium compared to domestic companies.

Moreover, untabulated regressions show that the effect of GVC participation is not limited to the extensive margins, but extends to the magnitude of the innovation undertaken and the degree of investment in R&D projects, especially for relational GVCs.

Table D.16: GVC participation and firms' innovativeness

Sample:	Entire				Y(t-1)=0			
	Y:	Innovation		R&D	Innovation		R&D	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
GVC	0.051*** (0.017)	--	0.034** (0.018)	--	0.067*** (0.021)	--	0.068*** (0.018)	--
Arm-length	--	-0.018 (0.013)	--	0.008 (0.011)	--	0.003 (0.019)	--	-0.001 (0.014)
Quasi-hierarchy	--	0.021 (0.014)	--	-0.001 (0.013)	--	0.023 (0.019)	--	0.016 (0.016)
Hierarchy	--	-0.011 (0.021)	--	-0.005 (0.013)	--	-0.011 (0.031)	--	-0.033 (0.025)
Relational	--	0.037*** (0.012)	--	0.037*** (0.012)	--	0.052*** (0.014)	--	0.058*** (0.014)
Controls								
Time	yes	yes	yes	yes	yes	yes	yes	yes
Industry (12)	yes	yes	yes	yes	yes	yes	yes	yes
Region (20)	yes	yes	yes	yes	yes	yes	yes	yes
Province (110)	yes	yes	yes	yes	yes	yes	yes	yes
Mundlak	yes	yes	yes	yes	yes	yes	yes	yes
Observations	35022	35022	35022	35022	17123	17123	17123	17123
Pseudo-R2	0.144	0.148	0.222	0.225	0.165	0.168	0.141	0.147

Notes: RE-probit models with Mundlak correction (marginal effects). The dependent variable is listed in the second row (Innovation and R&D in columns 1-2-5-6 and 3-4-7-8, respectively). The left panel reports the estimates for the entire sample, while the right panel refers to subset of firms with $Y_{t-1} = 0$. Additional covariates in the estimations (untabulated): size, age, sales, cash flow, market share, vertical integration, network, group, human capital, export, R&D (only for innovation as a dependent variable). *, **, *** denote, respectively, significance at 10%, 5%, and 1% level. Robust standard errors in parentheses.

Having established the effect of GVC participation on the firms' strategic behaviour, we now turn the attention on their productivity and sales growth. This additional focus can be viewed as a complementary perspective to our analysis of ex ante activities and allows us to provide some insights on the shock experienced by GVCs in the aftermath of the Great Recession. The GVC literature provides a clear guidance for the rationale underlying differential productivity levels across forms of governance. This section takes a step forward exploring structural breaks induced by the international turmoil and analysing the dynamic of economic performance.

While, due to data limitations, we are not able to study the behaviour of GVCs in normal times, the availability of a long panel for real outcomes offers the chance to perform a diff-in-diff exercise around the crisis. We do so by exploiting balance-sheet data from 2004 to 2013 and projecting backwards the 2008-values of our GVC proxies, thus assuming stability over missing years. We then

employ within estimators (with firm and time fixed effects) and interaction terms with pre-crisis (2004-2008) and crisis (2009-2013) dummies to analyse structural breaks between the two periods.

Notice that, because we project 2008-values back to 2004, any unobserved difference in the composition of the 2008 sample (compared to the other waves) may induce significant effects in the diff-in-diff exercise. In order to overcome this issue and have a clear comparison between the two periods, we focus this analysis on a balanced panel of firms.

Moreover, because the administration of the 2008-wave of the MET survey ended two weeks before the Lehman bankruptcy and since the Italian GDP did not start falling before 2009, we can reasonably think of 2008 as a pre-crisis period. Thus, backcasting the 2008-GVC measures implicitly imposes the assumption of pre-crisis stability of GVC participation. Before showing the results, it is worth discussing the measurement error and the bias induced by this last hypothesis. While we correctly identify firms in times of crisis, the backward projection of their status implies a mis-measurement of companies exiting or entering into a GVC before 2008. We regard the first type of error to be relatively negligible because internationalized firms are unlikely to withdraw from foreign markets in times of low domestic demand. Indeed, 2011-census data on Italian firms (ISTAT) show a 5%-increase in the overall number of exporters, with a marginal share of companies exiting international markets within the same period. Thus, if any measurement error occurs, it should mainly concern firms with a delayed entrance into GVCs. If this is the case, the productivity-gap between internationalized and non-internationalized companies should ensure a downward bias for the pre-crisis estimates of GVC participation. In fact, our proxies for GVCs before 2008 are grouping together highly productive companies (actually) involved in GVCs, with relatively less productive firms who engaged in international linkages only at a later time. As a result, any negative structural break on productivity and sales growth across periods may be interpreted as a lower bound for the actual shock.

Table D.17 presents the results. In the two sub-periods, GVCs displayed a significant productivity premium on aggregate, but mainly confined to relational forms of governance (columns 1 and 2). These findings are in line with the existing literature and confirm the crucial role played by firm capacity in affecting upgrading along a GVC. Interestingly, the comparison of pre- and post-crisis coefficients does not highlight any significant productivity shock across time.

Vice versa, column 3 documents a sizable drop in the sales growth of GVCs compared to their pre-crisis levels (-10.2 percentage points). This evidence is consistent with a strong demand shock and with previous arguments on the role of global networks in the transmission of the crisis (Baldwin, 2009). In particular, the severity of the sales collapse that followed the eruption of the financial turmoil can be seen as a signal of the relevant fall in demand for final goods that propagated backwards along firms involved in the GVCs.

Once again, relational value chains are found to largely outperform other modes of governance in both sub periods (column 4), possibly because of the higher degree of innovativeness of their products and the specific type of relationship underlying this form of governance.

The change in the pre- and post-crisis coefficients also highlights a significantly heterogeneous shock experienced by GVCs across forms of participation, with a sizable contraction only for quasi-hierarchical and arm-length market relationships. On the one hand, suppliers in quasi-hierarchical GVCs are heavily exposed to demand contractions because their low capability and high dependence on buyers prevent a diversification of the customer base. On the other, arm-length market relationships, based on occasional trade, are severely affected by fluctuations in demand because of the increasing competition and the negligible sunk costs for buyers in switching commercial partners.

Conversely, relational suppliers appear to be somewhat sheltered from the negative effects of the crisis. This may be due to the relevant sunk costs faced by global buyers in switching partners, as well as to the high skills of suppliers allowing to cushion negative shocks by adapting faster to the evolving market needs. Finally, our results point at negligible effects for hierarchical GVCs, possibly underlying the attempt of parent companies in shielding subordinated firms from adverse shocks.

Notice that this evidence is also consistent with Altomonte et al. (2012) showing how multinational groups were able to adjust faster to negative demand shocks (bullwhip effect).

Table D.17: GVC in times of crisis

Y:	Productivity growth				Sales growth				
	Period:	Pre-crisis	Crisis	Pre-crisis	Crisis	Pre-crisis	Crisis	Pre-crisis	Crisis
	(1)		(2)		(3)		(4)		
GVC	0.0555*** (0.0171)	0.0460*** (0.0166)	--	--	0.081*** (0.015)	-0.021 (0.015)	--	--	--
Arm-length	--	--	-0.022 (0.0231)	-0.016 (0.0277)	--	--	0.001 (0.0271)	-0.0121*** (0.0286)	--
Quasi-hierarchy	--	--	0.011 (0.0321)	-0.011 (0.0333)	--	--	0.0921*** (0.0265)	0.0333 (0.0269)	--
Hierarchy	--	--	0.0145 (0.0155)	0.0132 (0.0145)	--	--	0.0061 (0.0721)	0.0045 (0.0641)	--
Relational	--	--	0.0587*** (0.0109)	0.0599*** (0.0135)	--	--	0.108*** (0.0111)	0.0958*** (0.0133)	--
Controls									
Time	yes		yes		yes		yes		
Firm FE	yes		yes		yes		yes		
Observations	25092		25092		25092		25092		
R2	0.091		0.093		0.105		0.108		

Notes: within estimators with firm and time fixed effects. The dependent variable is listed in the first row ($\Delta \text{Log-productivity}$ and $\Delta \text{Log-sales}$ in columns 1-2 and 3-4, respectively). The effect of GVC and GVC forms of governance is allowed to vary in times of crisis (overall coefficient reported). Pre-crisis and crisis periods refer to 2004-2008 and 2009-2015, respectively. Additional covariates in the estimations (untabulated) follow the specification in Table D.16 (excluding Mundlak-type regressors). All measures are defined in Appendix. *, **, *** denote, respectively, significance at 10%, 5%, and 1% level. Robust standard errors in parentheses.

6.5 APPENDIX: ROBUSTNESS AND DATA DEFINITION

Table E.1: Probability of export: province controls

Y:	Export					
	(1)	(2)	(3)	(4)	(5)	(6)
Productivity	0.049*** (0.006)	0.039*** (0.006)	0.056*** (0.008)	0.097*** (0.008)	0.081*** (0.017)	0.075*** (0.017)
Size	0.205*** (0.005)	0.160*** (0.005)	0.170*** (0.006)	0.205*** (0.006)	0.206*** (0.011)	0.207*** (0.012)
Age	-0.004 (0.007)	-0.001 (0.007)	-0.009 (0.008)	-0.015* (0.008)	-0.039*** (0.015)	-0.043*** (0.015)
Capitalisation	0.014*** (0.002)	0.013*** (0.002)	0.014*** (0.003)	0.001 (0.003)	-0.023*** (0.008)	-0.023*** (0.008)
Group	0.143*** (0.018)	0.114*** (0.018)	0.100*** (0.020)	0.069*** (0.020)	0.027 (0.031)	0.017 (0.031)
Import	1.212*** (0.021)	1.148*** (0.021)	1.250*** (0.025)	1.223*** (0.025)	1.221*** (0.043)	1.253*** (0.044)
Innovation	--	0.194*** (0.015)	0.190*** (0.016)	0.188*** (0.016)	0.174*** (0.029)	0.180*** (0.029)
R&D	--	0.540*** (0.018)	0.565*** (0.020)	0.552*** (0.020)	0.624*** (0.032)	0.594*** (0.032)
Investment	--	0.043*** (0.014)	0.042*** (0.015)	0.046*** (0.015)	0.041 (0.027)	0.038 (0.027)
Sales	--	--	0.003 (0.009)	-0.069*** (0.011)	-0.035* (0.021)	-0.034 (0.021)
Sales growth	--	--	0.016 (0.015)	0.037** (0.015)	0.063* (0.032)	0.075** (0.033)
ROA	--	--	0.045 (0.064)	0.106 (0.069)	-0.125 (0.198)	-0.054 (0.199)
Vertical int.	--	--	--	-0.888*** (0.040)	-0.790*** (0.117)	-0.835*** (0.118)
Cost of labor	--	--	--	-0.020 (0.017)	-0.257* (0.145)	-0.217 (0.147)
Leverage	--	--	--	--	-0.095*** (0.017)	-0.096*** (0.017)
Net acc. payable	--	--	--	--	0.378*** (0.076)	0.378*** (0.077)
Bank debt	--	--	--	--	0.342*** (0.088)	0.369*** (0.089)
Human capital	--	--	--	--	--	0.539*** (0.077)
Domestic net.	--	--	--	--	--	-0.117*** (0.028)
Constant	-1.660*** (0.149)	-1.681*** (0.151)	-1.974*** (0.177)	-2.014*** (0.178)	-1.288*** (0.428)	-1.196*** (0.430)
Controls						
Province	yes	yes	yes	yes	yes	yes
Industry	yes	yes	yes	yes	yes	yes
Time	yes	yes	yes	yes	yes	yes
Mundlak	no	no	no	no	no	no
Observations	50,309	50,309	41,792	41,791	13,434	13,221
Pseudo R2	0.221	0.243	0.242	0.252	0.284	0.290

Notes: pooled probit models (estimates). The dependent variable is the extensive margin of export (Export), a dummy variable identifying exporting companies. Datasource: yearly balance-sheet data (Cribis D&B) and MET surveys 2008, 2009, 2011, 2013, and 2015. All measures are defined in Appendix. *, **, *** denote, respectively, significance at 10%, 5%, and 1% level. Robust standard errors in parentheses.

Table E.2: Probability of export: manufacturing sector only

Y:	Export					
	(1)	(2)	(3)	(4)	(5)	(6)
Productivity	0.035*** (0.007)	0.027*** (0.007)	0.056*** (0.011)	0.085*** (0.011)	0.070*** (0.022)	0.060*** (0.023)
Size	0.296*** (0.007)	0.243*** (0.007)	0.258*** (0.008)	0.273*** (0.008)	0.237*** (0.014)	0.238*** (0.014)
Age	0.006 (0.009)	0.011 (0.009)	0.004 (0.010)	-0.003 (0.010)	-0.026 (0.019)	-0.030 (0.019)
Capitalisation	0.014*** (0.003)	0.012*** (0.003)	0.005 (0.005)	-0.008* (0.005)	-0.040*** (0.013)	-0.039*** (0.013)
Group	0.049** (0.023)	0.026 (0.023)	-0.006 (0.025)	-0.031 (0.025)	-0.052 (0.036)	-0.074** (0.037)
Import	1.136*** (0.024)	1.067*** (0.025)	1.174*** (0.029)	1.146*** (0.029)	1.161*** (0.047)	1.197*** (0.049)
Innovation	--	0.192*** (0.018)	0.179*** (0.020)	0.173*** (0.020)	0.156*** (0.034)	0.152*** (0.034)
R&D	--	0.517*** (0.022)	0.544*** (0.024)	0.540*** (0.024)	0.567*** (0.037)	0.535*** (0.037)
Investment	--	0.057*** (0.017)	0.061*** (0.018)	0.071*** (0.018)	0.111*** (0.032)	0.106*** (0.032)
Sales	--	--	-0.033** (0.015)	-0.123*** (0.016)	-0.090*** (0.031)	-0.091*** (0.031)
Sales growth	--	--	0.005 (0.018)	0.025 (0.018)	0.022 (0.038)	0.034 (0.039)
ROA	--	--	-0.108 (0.086)	0.032 (0.091)	-0.131 (0.228)	-0.065 (0.229)
Vertical int.	--	--	--	-0.982*** (0.058)	-1.037*** (0.176)	-1.085*** (0.179)
Cost of labor	--	--	--	0.013 (0.019)	0.042 (0.221)	0.083 (0.225)
Leverage	--	--	--	--	-0.112*** (0.022)	-0.112*** (0.022)
Net acc. payable	--	--	--	--	0.692*** (0.099)	0.697*** (0.100)
Bank debt	--	--	--	--	0.436*** (0.105)	0.448*** (0.106)
Human capital	--	--	--	--	--	0.658*** (0.113)
Domestic net.	--	--	--	--	--	-0.070** (0.032)
Constant	-1.365*** (0.091)	-1.392*** (0.092)	-1.592*** (0.120)	-1.466*** (0.121)	-0.626** (0.253)	-0.508** (0.257)
Controls						
Region	yes	yes	yes	yes	yes	yes
Industry	yes	yes	yes	yes	yes	yes
Time	yes	yes	yes	yes	yes	yes
Mundlak	no	no	no	no	no	no
Observations	32,242	32,242	26,727	26,727	9,963	9,773
Pseudo R2	0.211	0.234	0.232	0.240	0.256	0.262

Notes: pooled probit models (estimates). The dependent variable is the extensive margin of export (Export), a dummy variable identifying exporting companies. Datasource: yearly balance-sheet data (Cribis D&B) and MET surveys 2008, 2009, 2011, 2013, and 2015. All measures are defined in Appendix. *, **, *** denote, respectively, significance at 10%, 5%, and 1% level. Robust standard errors in parentheses.

Table E.3: Probability of export: region*time and sector*time fixed effects

Y:	Export					
	(1)	(2)	(3)	(4)	(5)	(6)
Productivity	0.049*** (0.006)	0.039*** (0.006)	0.057*** (0.008)	0.098*** (0.008)	0.079*** (0.017)	0.071*** (0.017)
Size	0.204*** (0.005)	0.159*** (0.005)	0.169*** (0.006)	0.205*** (0.006)	0.203*** (0.011)	0.205*** (0.011)
Age	-0.000 (0.007)	0.003 (0.007)	-0.004 (0.008)	-0.011 (0.008)	-0.034** (0.015)	-0.037** (0.015)
Capitalisation	0.012*** (0.002)	0.011*** (0.002)	0.012*** (0.003)	-0.000 (0.003)	-0.023*** (0.008)	-0.022*** (0.008)
Group	0.152*** (0.018)	0.124*** (0.018)	0.111*** (0.020)	0.079*** (0.020)	0.031 (0.031)	0.020 (0.031)
Import	1.205*** (0.021)	1.142*** (0.022)	1.249*** (0.025)	1.220*** (0.025)	1.206*** (0.043)	1.241*** (0.044)
Innovation	--	0.194*** (0.015)	0.192*** (0.016)	0.189*** (0.017)	0.192*** (0.029)	0.199*** (0.029)
R&D	--	0.539*** (0.018)	0.565*** (0.020)	0.552*** (0.020)	0.610*** (0.032)	0.579*** (0.032)
Investment	--	0.044*** (0.014)	0.043*** (0.015)	0.047*** (0.015)	0.039 (0.027)	0.036 (0.027)
Sales	--	--	0.004 (0.009)	-0.070*** (0.011)	-0.033 (0.021)	-0.031 (0.021)
Sales growth	--	--	0.016 (0.015)	0.036** (0.015)	0.047 (0.033)	0.059* (0.033)
ROA	--	--	0.036 (0.064)	0.098 (0.069)	-0.205 (0.198)	-0.149 (0.199)
Vertical int.	--	--	--	-0.899*** (0.040)	-0.774*** (0.116)	-0.815*** (0.117)
Cost of labor	--	--	--	-0.015 (0.017)	-0.293** (0.144)	-0.253* (0.145)
Leverage	--	--	--	--	-0.097*** (0.017)	-0.097*** (0.017)
Net acc. payable	--	--	--	--	0.376*** (0.075)	0.378*** (0.076)
Bank debt	--	--	--	--	0.364*** (0.087)	0.386*** (0.088)
Human capital	--	--	--	--	--	0.547*** (0.077)
Domestic net.	--	--	--	--	--	-0.111*** (0.028)
Constant	-1.417*** (0.108)	-1.457*** (0.109)	-1.648*** (0.124)	-1.732*** (0.124)	-1.071*** (0.227)	-0.983*** (0.230)
Controls						
Province	yes	yes	yes	yes	yes	yes
Industry	yes	yes	yes	yes	yes	yes
Time	yes	yes	yes	yes	yes	yes
Region*Time	yes	yes	yes	yes	yes	yes
Industry*Time	yes	yes	yes	yes	yes	yes
Mundlak	no	no	no	no	no	no
Observations	50,242	50,242	41,757	41,756	13,420	13,209
Pseudo R2	0.224	0.246	0.244	0.254	0.280	0.286

Notes: pooled probit models (estimates). The dependent variable is the extensive margin of export (Export), a dummy variable identifying exporting companies. Datasource: yearly balance-sheet data (Cribis D&B) and MET surveys 2008, 2009, 2011, 2013, and 2015.. *, **, *** denote, respectively, significance at 10%, 5%, and 1% level. Robust standard errors in parentheses.

Table E.4: Definition of the variables employed in the econometric analysis

Variable	Definition
Export	Dummy variable for exporting companies
Export(EU)	Dummy variable for companies exporting only in the EU area
Export(extraEU)	Dummy variable for companies exporting beyond EU area
Export share	Share of sales from exported products
Export sales	Value of exported products
Export sales growth	$\Delta \ln(\text{export sales})$
Export(>25)	Dummy variable for companies exporting more than 25% of their total sales
Two-way	Dummy variable for two-way traders (exporting & importing)
Import	Dummy variable for importers
FDI	Dummy variable for firms with foreign direct investments
Production	Dummy variable for firms with foreign production processes abroad
Productivity	$\ln(\text{value added} / \# \text{ employees})$
Size	$\ln(\# \text{ employees})$
Age	$\ln(1 + \text{age})$
Capitalisation	$\ln(\text{physical capital} / \# \text{ employees})$
Group	Dummy variable for group membership
Innovation	Dummy variable for the introduction of innovations (independently of the type)
Product inn.	Dummy variable for the introduction of product innovations
Process inn.	Dummy variable for the introduction of process innovations
Organis. inn.	Dummy variable for the introduction of organisational-managerial innovations
R&D	Dummy variable for the existence of R&D projects
R&D share	Expenditure in R&D (as a share of sales)
Sales	Sales / total assets
Sales growth	$\Delta \ln(\text{sales})$
ROA	Net income / total assets
Vertical integration	Value added / total turnover
Cost of labour	Cost of labour / total cost of production
Leverage	Total assets / equity
Net acc. payable	(Accounts payable - accounts receivable) / total assets
Bank debt	Bank debt / total assets
Human capital	% of graduated employees (tertiary education)
Domestic network	Dummy variable for local domestic relationships with other companies

7 THE IMPACT OF THE CRISIS ON THE DRIVERS

This section provides some hints on the impact of the crisis on Italian firms' external competitiveness by analysing the evolution during the entire time span of the recession of the drivers identified in previous chapters. In particular, next pages analyse the time series patterns in order to highlight potential structural breaks induced by the 2008 turmoil and the associated drop in international trade. By overviewing the diffusion, the amount of resources and the mode whereby these phenomena are carried out by firms, we are able to lay out some granular insights on the forces underpinning the aggregate dynamics sketched at the beginning of the document as well as on the potential developments in the near future.

The main findings could be outlined in the following way:

- The crisis has severely hit the Italian industrial system bringing about deep changes in its population and firms' strategies. The evidences show that firms' attitudes towards internationalisation and its drivers has changed in-between the first and the second phases of the crisis. At the beginning of the outbreak, many firms decided to "wait for better times", halting their investments/innovative activities. However, the negative expectations on market opportunities generated by the protraction of the recession (especially on the domestic market) has spurred many companies to undertake international and innovative patterns in order to become sufficiently competitive to survive and (sometimes) compete on a global scale.
- After an initial deep fall in the diffusion of firms undertaking dynamic behaviours, starting from 2010-2011, data show a rebound of these phenomena. Similarly to what happens for the share of exporting firms, in 2015 the percentage of companies investing in R&D activities outstrips the pre-crisis levels. To this extent, the industrial system exiting the crisis turns out to lean on research and development more than the one entering the crisis.
- Innovation activities exhibit a similar pattern. However, the uncomplete macroeconomic recovery together with the intrinsic degree of uncertainty prevented the rate of innovative firms from reaching its 2008 levels yet.
- The category that has been affected the most by the outbreak of the crisis is represented by product innovations. As a matter of fact it represents the type of innovation more closely related to the market conditions. However, as soon as the sovereign debt crisis made clear that the recession would not cease, the diffusion of product innovators started to rise again.
- On the contrary, the diffusion of process and organisational/managerial/marketing innovations experienced a milder cutback. After the arrival of the second phase of the crisis, the share of organisations adopting new production techniques and/or new organisational/managerial/marketing practices have been soaring towards the values exhibited in 2008. Contrary to what observed for product innovations, however, the diffusion of these strategies is comparable to the one detected before the crisis. In particular, the share of process innovators has already fully recovered.
- All these evidences on the industrial system very often mirror the behaviours of micro-sized business activities. Once focusing on medium and large firms, however, the rebound of the diffusion of investments and R&D activities started even before the 2010-2011 period.
- Changes occurred during the crisis do not relate to the diffusion of innovation only, but also to the mode this innovation is carried out. Indeed, the Italian firms' innovation has often been labelled as 'without R&D', due to the lack of codified research projects underpinning the implemented technological changes. During the recession, however, industrial sectors witnessed a constant increment in the share of businesses undertaking R&D activities among innovators, thus increasing the importance of innovations backed by solid scientific results.

The analyses carried out in the previous chapters have identified a large set of factors underpinning Italian firms' external competitiveness. These factors range from structural characteristics, technical capacities, economic performances and strategic behaviours. As for the latter ones, both the descriptive statistics and the econometric estimates pointed out the forefront role played by innovative activities in building competitive advantages. In particular, the results of the econometric estimates suggest that these types of strategies may act both directly and indirectly (i.e. via increments in productivity levels) on the ability of an organisation to compete on international markets. To this extent, any attempt to assess the impact of the crisis on Italian firms' competitiveness needs to consider the evolution of these strategies throughout the recent past. This approach has two important advantages. First of all the analysis of the evolution of innovative activities provides a micro-based explanation for macroeconomic aggregate trends. In other words, the study of the way firms have changed their innovative activities is fundamental to fully understand macroeconomic data. Secondly, an assessment of the development of innovative activities based on microeconomic data gives many insights as for potential evolutions in the near future.

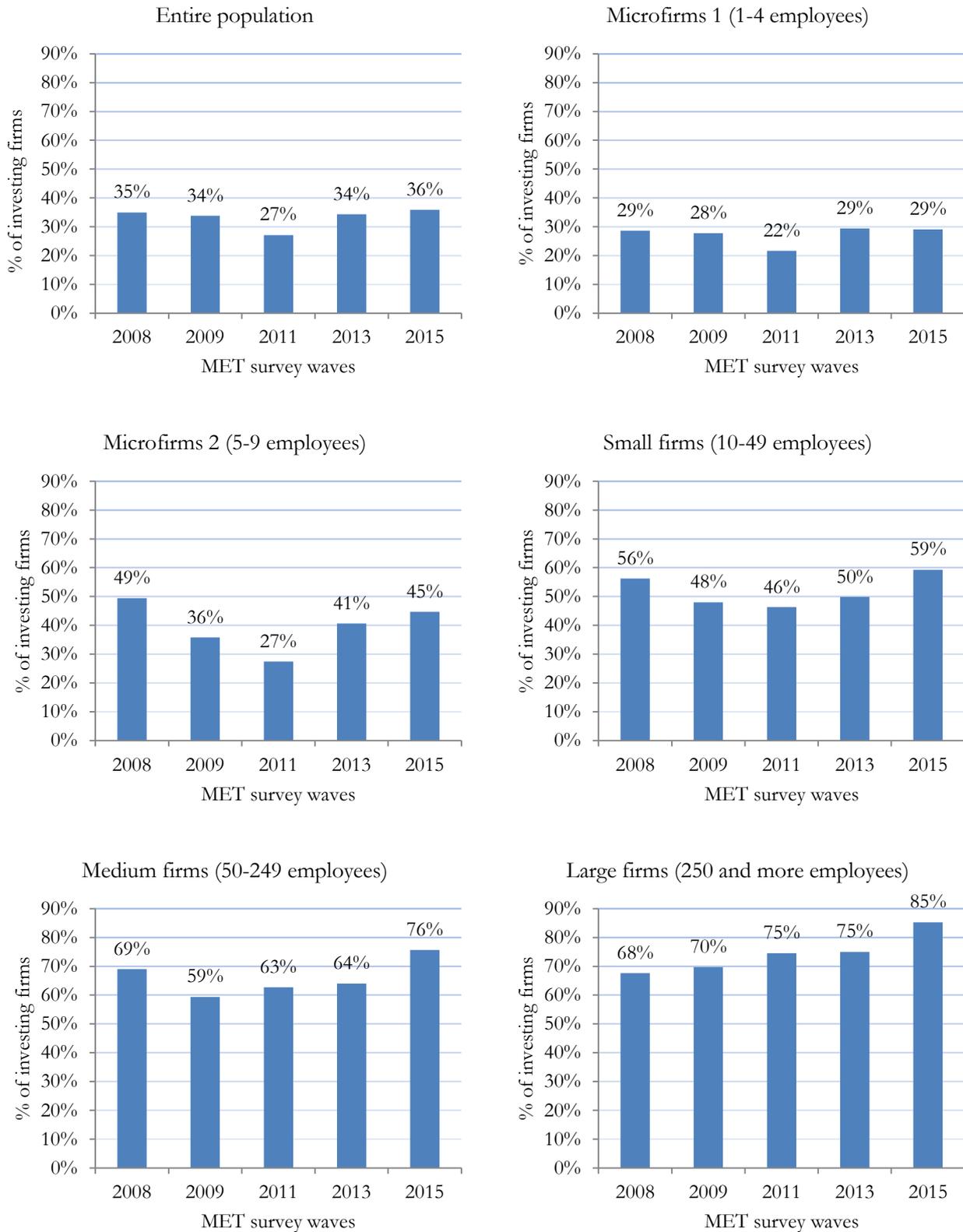
Moreover, this study is also extremely relevant under a policy point of view. As a matter of fact, differently from structural characteristics (i.e. productivity and size), innovative activities represent a target that policy measures can seek to influence directly. However, in order to appraise the potential outcome of any policy, one has to consider the way innovation has changed throughout the crisis.

As a result, this chapter provides some descriptive statistics on the development of the main indices measuring the diffusion, the extent, and the mode innovative activities are carried out. The data are drawn from the five waves of the MET sample survey and embrace a period of time starting right before the outbreak of the financial crisis (wave 2008) through to the most recent years (wave 2015). The employment of MET database instead of the ISTAT one is indeed justified by the fact that the former encompasses a larger time span than the latter, allowing for a thorough study of the evolution of the main indices.

The first aspect to be considered to evaluate the impact of the crisis on the Italian industrial system is the pattern followed by investments. As a matter of fact, investments are fundamental for building organisational competitive advantages. For example, by purchasing new machineries and/or hiring new labour forces the firm absorbs new technological knowledge that could both improve its current productivity and foster future innovative activities. Figure F.1 plots the share of investing companies over the crisis both by the entire population and by each single size class.

It is worth point out that, differently from aggregate data, MET survey contains qualitative information on investment behaviours. As a matter of fact the questionnaire asks for the presence of new investments, regardless their entity. To this extent, the dynamic of investments drawn by MET data may not coincide with of the one highlighted by macroeconomic trends. As a matter of fact, the presence of small investments is treated similarly to the presence of large investments. On the one hand, the shortcoming of this approach is, for example, that the purchase of highly technological machineries is regarded in the same way as the purchase of one laptop. On the other hand, however, the advantage is that this approach allows us to study investments behaviours of micro-sized companies.

Figure F.1: Firms undertaking investments activities



Note: Data refer to industrial firms.
 Source: MET sample survey, waves from 2008 to 2015.

Provided that, data on the entire population show that, whilst the rate of investing firms has started to decrease immediately after the beginning of the recession (in between 2008 and 2009), the largest fall of this index occurred in correspondence of the run-up to the second phase of the crisis, labelled

‘sovereign debt crisis’. Nevertheless, after 2011, the share of businesses undertaking investments has experienced a rebound that has brought the diffusion of this activity back to its pre-crisis levels.

In size-class terms, the crisis hit harder the group of smallest businesses with a slightly structured organisation (5-9 employees). As a matter of fact the rate of investing firms among organisations with less than 5 employees have been low but quite stable over the entire time span (except for a mild reduction around 2011). On the contrary, companies with 5 to 9 employees have been extremely sensitive to the surge of the recession, and their rate of investments exhibit the largest variation among all the size classes.

Indeed, before the outbreak of the crisis almost one out of two micro-firms belonging to this category used to carry out investments (49%), a percentage slightly lower the one detected among small firms. At the outset of the recession, however, this share fell to 36% and continued this trend by reaching 27% in 2011. Starting from 2012-2013, this index experienced a significant rebound, even though pre-crisis performances have not been recovered yet.

In a similar vein, rightly after 2008, small firms experienced a significant fall of their investment rate. However, their degree of sensitivity of this class of companies seems to be lower than the one exhibited by micro-firms. As a matter of fact the drop in the share of investing businesses slowed down immediately after the burst of the financial bubble. On top of that, the rate of investments among small companies has recently overtaken the pre-crisis levels, differently from what detected among micro-sized organisations.

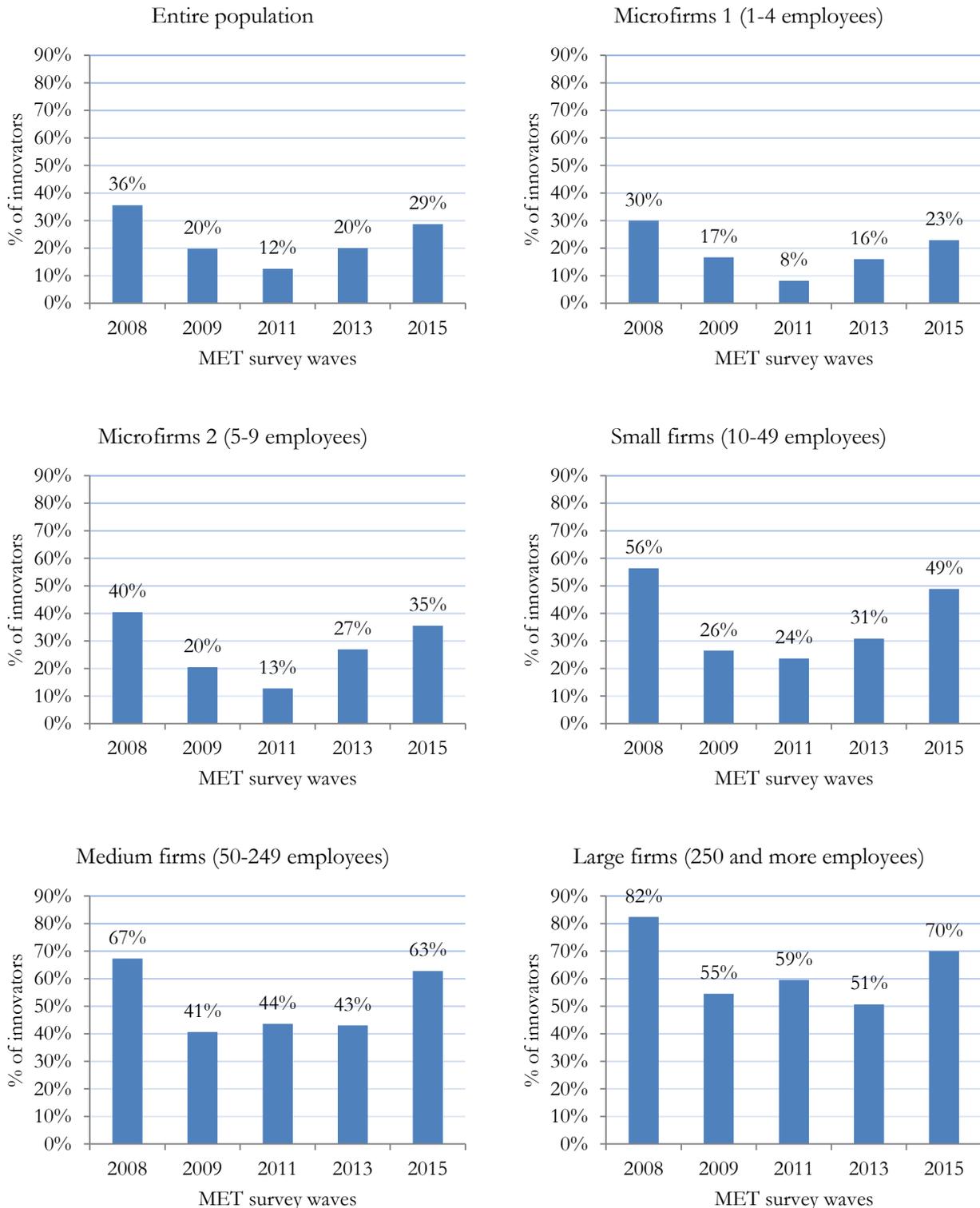
Medium-sized and large companies show two different patterns. Among the former the rebound started after the end of the first wave of the crisis, while among the latter the share of investing firms has been increasing since the pre-crisis period. In both cases, then, organisations have implemented anti-cyclical strategies to cope with the fall of the aggregate demand.

Digging deeper into the effects of the crisis on the drivers of external competitiveness, Figure F.2 reports the evolution of the shares of firms introducing at least one type among product, process or organisational/managerial/marketing innovations. According to MET survey information, in the aftermath of 2008 the share of innovators experienced a significant decrease through to 2011. Indeed, the drop of domestic and foreign aggregate demands intertwined both with the shortage of financial resources needed to develop new technologies and with the high level of uncertainty embedded in innovative activities, producing a reduction in firms’ propensity to innovate.

Starting from the second phase of the crisis, however, the prolonged lack of an adequate domestic demand influenced companies’ expectations by spurring a larger and larger share of them to act proactively against the economic cycle. These factors may have generated a rebound similar to one highlighted for the investments rate. On top of that, it is worth emphasizing that, whilst the spreading of innovations has not reached its 2008 values yet, the trend pointed out by the histograms in Figure 2 clearly shows that a recovery path is under way⁴¹.

⁴¹ It is important to underline that MET data on innovative activities may not coincide with the Community Innovation Survey (CIS) estimates for a set of important reasons. The first one relates to the years reference of the two surveys. Indeed MET survey and CIS waves do not coincide, as such their periods of reference are not entirely comparable. Secondly, MET and CIS differ in the ways their questionnaires are compiled. MET interviews are carried out either via telephone interviews or via web (see further below in the Appendix) while CIS questionnaires are sent by mail. Thirdly, the populations of reference are different for CIS includes constructions among industrial sectors whereas MET survey does not. Fourthly, firm sizes are measured in different ways. As a matter of fact the CIS questionnaire asks for the average number of employees in the first and in the last years of reference while MET survey asks for the overall number of employees as of December the 31st of the year of the wave. Fifthly, MET survey looks exclusively at the innovation introduced while CIS accounts also for those not yet implemented. Finally, MET survey regards R&D separately from the other types of investments while CIS includes them with the other varieties (such as the purchase of new machineries or the hiring of new labourers).

Figure F.2: Innovators throughout the crisis



Note: Data refer to industrial firms. Innovators include all the firms that have introduced at least one type of innovation during the reference period of the survey wave. The types of innovation accounted for embrace the introduction of new products, the introduction of new production processes, and the implementation of new organisational/managerial/marketing practices.
 Source: MET sample survey, waves from 2008 to 2015.

In size class terms, the pattern just described can be detected among micro- and small- firms. On the contrary, among organisations with more than 49 employees, the share of innovators, after an initial collapse, has been swinging around the 2009 levels until 2014-2015. Indeed, during these two years,

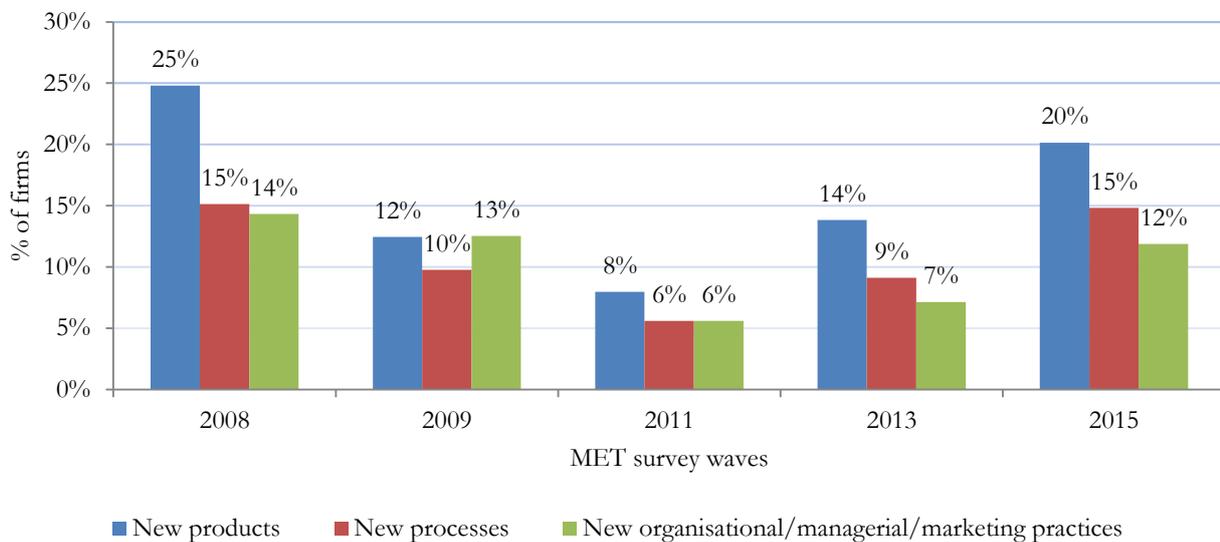
the diffusion of innovative activities among medium and large businesses has risen sharply. In particular, among medium companies, this index has almost come back to its pre-crisis values.

Moreover, it is worth pointing out that the recent increment in the diffusion of innovative activities has involved a significant share of organisations. In fact, starting from the larger class of micro-sized businesses (i.e. from 5 employees onward), innovators account for one company out of three. However, if the analysis is carried out on a slightly narrower range (i.e. from 10 employees onward), this same share amounts almost to one company out of two. On top of that, the data in Figure 2 show that the presence of innovators among micro-sized companies has almost tripled during the period 2012-2015. In this sense, this micro-firms exhibited the fastest diffusion of innovative behaviours.

The breakdown of firms by types of innovations introduced reveals that the general pattern highlighted in Figure F.3 is not bound to a specific category but can, instead, be detected in similar, albeit not identical, forms among product, process, and organisational/managerial/marketing innovators. Provided that, there are some differences among the paths followed from the three types.

The category that has been affected the most by the outbreak of the crisis is represented by product innovations. Indeed, the share of companies introducing new varieties on markets dropped dramatically in the wake of the outset of the recession, passing from 25% in 2008 to 12% in 2009. The shrinking of this index has been continuing until 2012-2013, reaching a minimum (8%) around 2011. In the following two-year period, as soon as the sovereign debt crisis made clear that the recession would not cease, the diffusion of product innovators started to rise again. This increment has been continuing over the 2013-2015 period leading the industrial system almost back to its pre-crisis levels. However, the presence of product innovators is still far from being fully recovered.

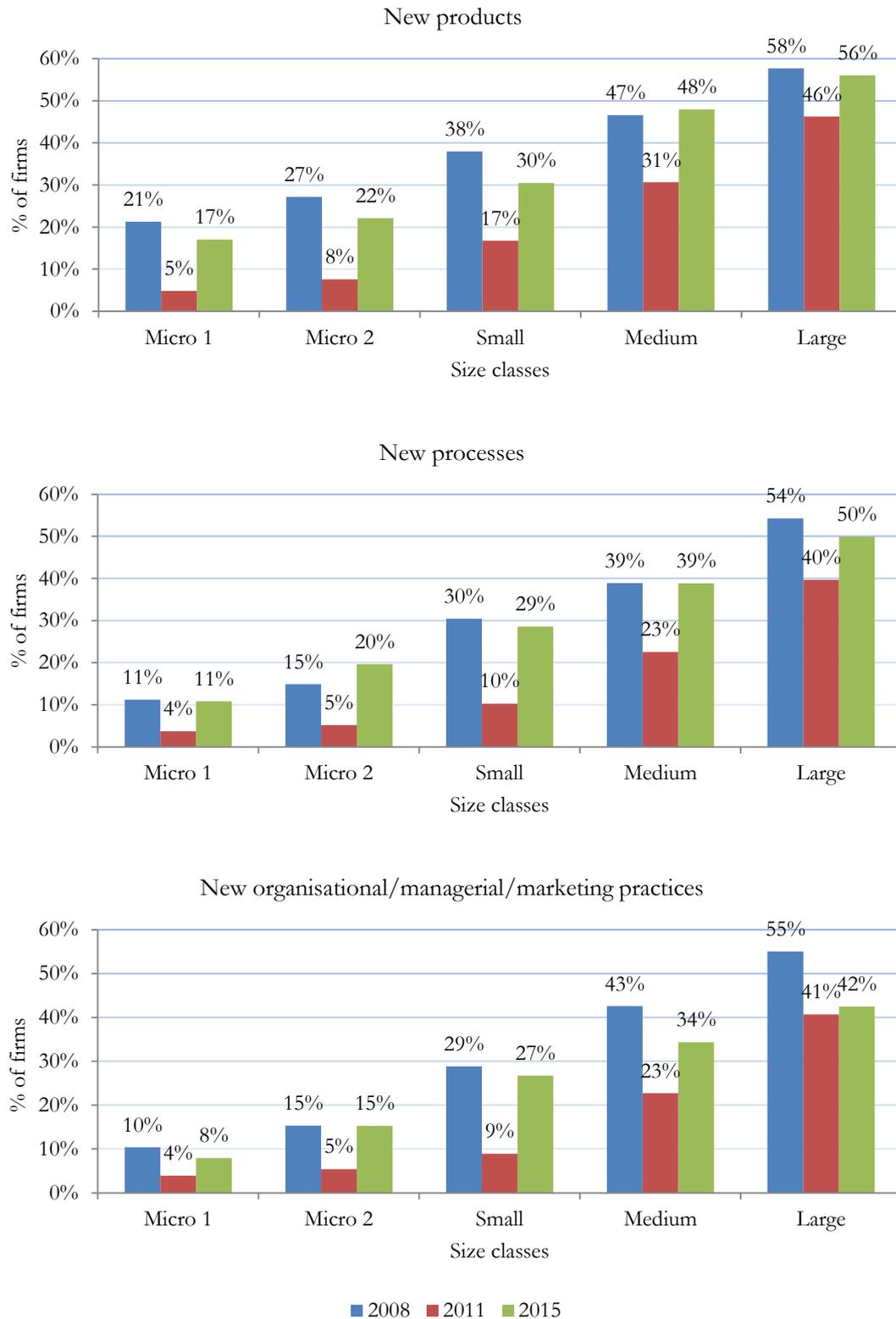
Figure F.3: Diffusion of each type of innovation during the crisis



Note: Data refer to industrial firms. The height of the bars represents the share of firms that introduced a specific type of innovation during the period of reference of the MET survey wave. The types of innovation are the following: (i) introduction of new products, (ii) introduction of new production processes, (iii) implementation of new organisational/managerial/marketing practices. Notice that these three classes are not mutually exclusive, i.e. a firm may introduce new products and/or new production processes and/or new organisational/managerial/marketing practices. In this sense a firm may fall within more than one group.

Source: MET sample survey, waves from 2008 to 2015.

Figure F.4: Diffusions of each type of innovations within size classes



Note: Data refer to industrial firms. The height of the bars represents the share of firms that introduced a specific type of innovation during the period of reference of the MET survey wave. The upper panel refers to the introduction of new products, the middle panel to the introduction of new production processes, while the lower panel to the implementation of new organisational/managerial/marketing practices. Notice that these three classes are not mutually exclusive, i.e. a firm may introduce new products and/or new production processes and/or new organisational/managerial/marketing practices. In this sense a firm may fall within more than one group.

Source: MET sample survey 2008, 2011, and 2015.

On the contrary, the diffusion of process and organisational/managerial/marketing innovations experienced a milder cutback. Indeed, the percentage of business companies undertaking these types of changes passed from 15% -14% in 2008 to 6% in 2011. Furthermore, especially for the latter category, the largest fall occurred in-between 2009 and 2011. As highlighted in the background scenario, during these years Italy has been showing a weak, although insufficient, rebound in macroeconomic aggregates. After the arrival of the second phase of the crisis, the share of organisations adopting new production techniques and/or new organisational/managerial/marketing practices have been soaring towards the values exhibited in 2008. Contrary to what observed for product innovations, however, the diffusion of these strategies is comparable to the one detected before the crisis. In particular, the share of process innovators has already fully recovered.

Overall, then, the crisis has severely hit Italian firms' propensity to innovate. In particular, the negative expectations on market opportunities generated by the protraction of the recession has narrowed the possibilities for the introduction of new varieties of products. Even when business activities started to set up pro-active strategies, the uncertainty about the aggregate demand have spurred many firms to prefer new processes or organisational/managerial/marketing practices rather than new products.

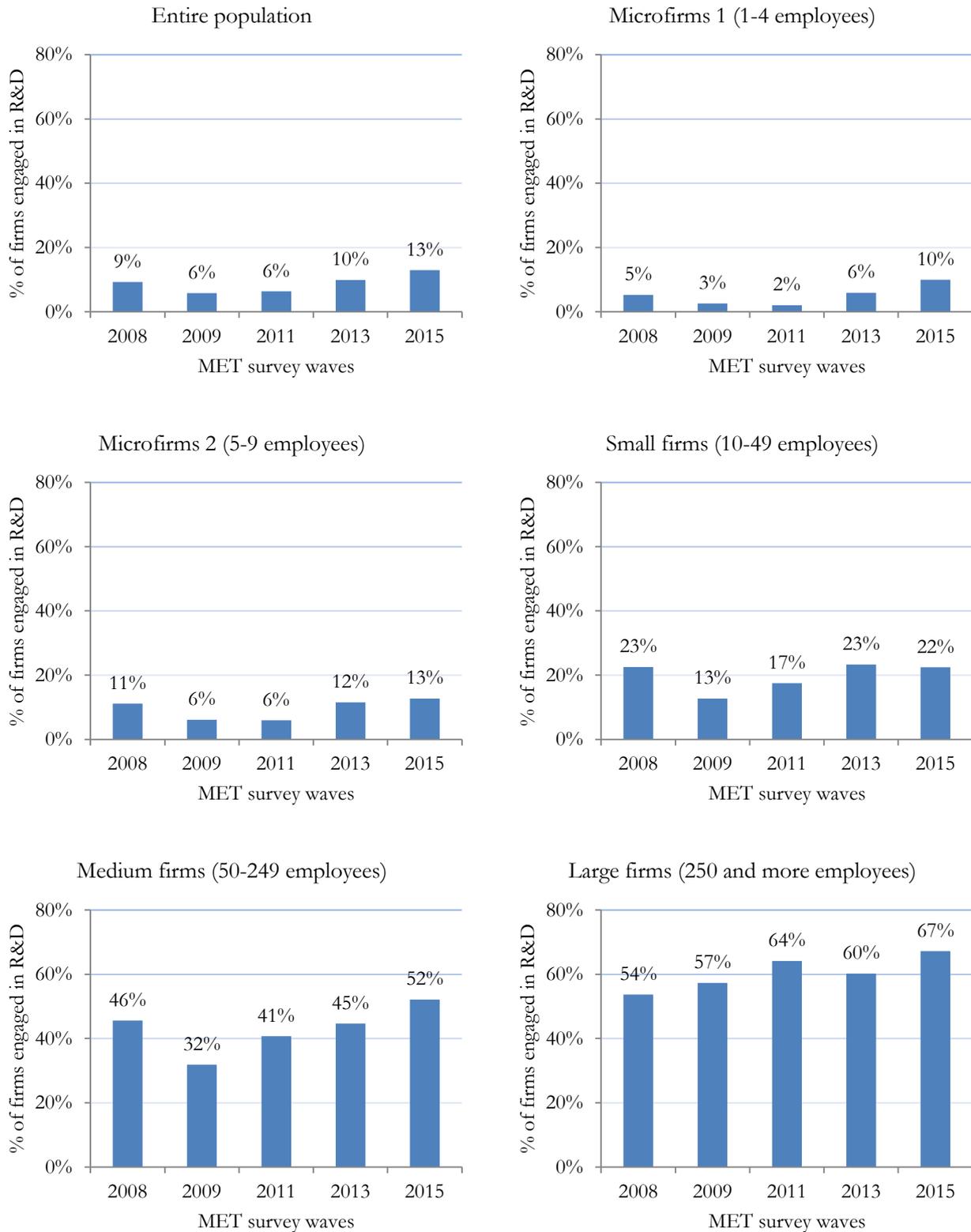
In size-class terms, the gap in the share of product innovators between 2008 and 2015 follows largely from micro and small firms' behaviours. In particular, among the companies falling within the range '5-49 employees', the presence of business activities introducing new varieties of goods is still far from accomplishing its recovery (Figure F.4). On the contrary, among medium firms the presence of product innovators has already overtaken its pre-crisis levels and, in 2015, accounted for almost one organisation out of two.

As for the other two types, the data draw a partially different situation. Indeed, in terms of new processes, the 2015 shares of micro- and medium-sized innovators are larger or equal the ones detected in 2008, whereas among small and large companies this index has almost overtaken the pre-crisis values. In terms of new organisational/managerial/marketing practices, the difference between the shares in 2008 and those in 2015 follows especially from the behaviours of medium and large organisations.

A similar picture can be drawn if the focus shifts from innovative outcomes to innovative inputs. As a matter of fact, the rebound of Italian firms' innovative activities during the second phase of the crisis stands out even when the analysis looks at the diffusion of R&D (Figure F.5).

At the outset of the crisis the share of companies engaged in research and development projects fell from 9% to 6% in consequence of the turbulence generated by macroeconomic events. This index remained constant over the period 2009-2011, i.e. in-between the two phases of the recession. In the wake of the surge of the 'sovereign debt crisis', however, the presence of companies undertaking formal R&D activities among industrial business activities sharply increased. Indeed, between 2012 and 2013 this percentage passed from 6% to 10%, overtaking the values reached in 2008. This positive trend continued in the subsequent years such that, in 2015, R&D firms amounted to 13% of the overall population of industrial sectors. As before, then, the crisis initially dampened firms' engagement in codified research and development activities due to the collapse of the aggregate demand and to the reduction of disposable financial resources. On the contrary, once the economic operators have become acquainted with the prolonged recession, the combination between markets' churning and the necessity of improving competitiveness to survive has brought about an increment of the share of business activities undertaking R&D projects. In this sense, the industrial system that survived the crisis is more innovative than the one that went through it.

Figure F.5: Firms engaged in R&D activities during the crisis



Note: Data refer to industrial firms. The height of the bars represents the share of companies undertaking R&D activities during the period of reference of the corresponding MET survey wave.

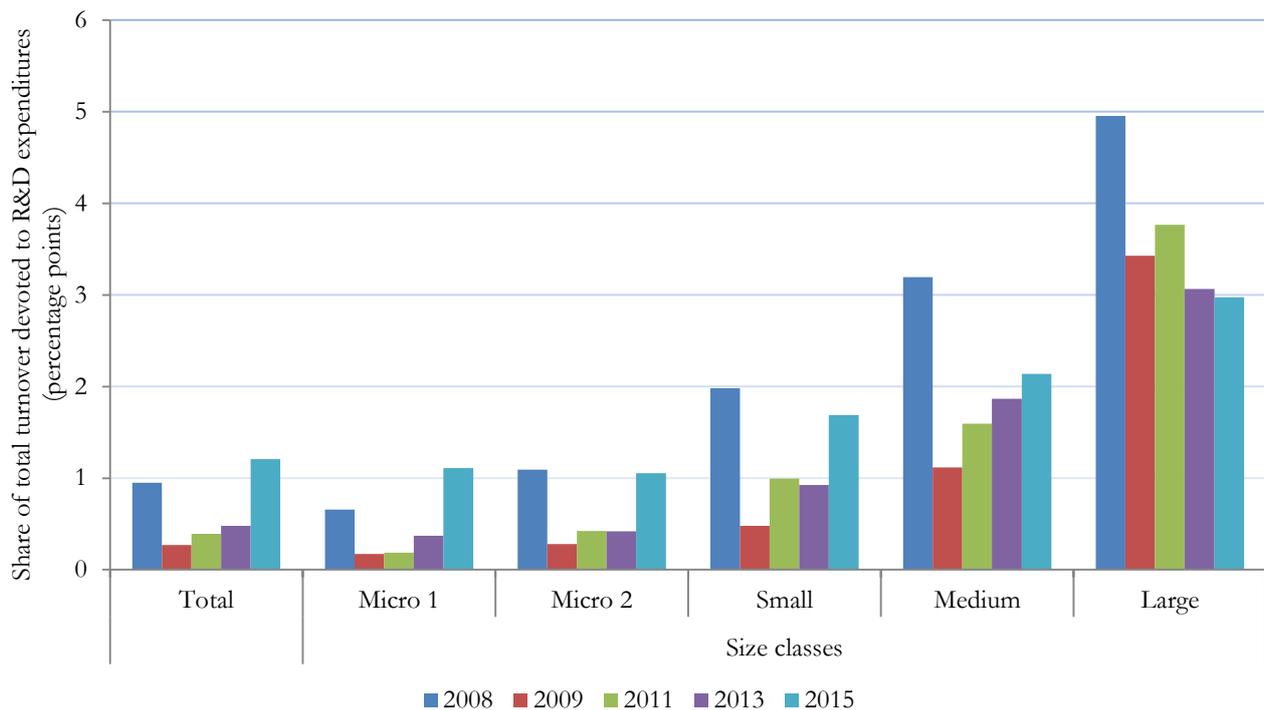
Source: MET sample survey, waves from 2008 to 2015.

On top of these elements, these trends, measured in terms of shares of active firms, could be significantly affected by market exits and new-born behaviours. However, the analysis of the estimated number of R&D firms, over the analysed period, leads to similar conclusions: the number of companies engaged in R&D activities has been increasing since 2011 and overtook the pre-crisis value in the last sample survey.

The dynamics just described largely follows from micro-firms behaviours. As a matter of fact, among Italian SMEs (10-249 employees), the share of organisations with an ongoing R&D activity started to recover before the arrival of the second phase of the crisis, right after the first downturn in 2009. Moreover, among large companies the share of organisations engaged in research and development have been increasing throughout the years 2008-2015 (except for a mild reduction between 2011 and 2014). To this extent, data in Figure 5 point out not only that R&D activities have been playing an increasingly important role among Italian firms, but also that, for a group of business activities that included small companies, this trend already begun in the wake of the financial crisis.

Moreover, the analysis of R&D activities also reveals that the recent increment in their diffusion has been coupled with an increment in the amount of resources devoted to them by firms. As a matter of fact, companies' average R&D expenditure (expressed in terms of total turnover) has been steadily increasing since the aftermath of the financial crisis, with a surge occurred between 2013 and 2015 (Figure F.6). Thanks to such an acceleration this index has overtaken its pre-crisis levels. In this sense, then, Italian firms put more effort in research and development today than they used to do during the run-up of the recession.

Figure F.6: Expenditure in R&D throughout the crisis



Note: Data refer to industrial firms. The height of the bars represents the average expenditure in R&D as a share of total turnover during the period of reference of the corresponding MET survey wave.

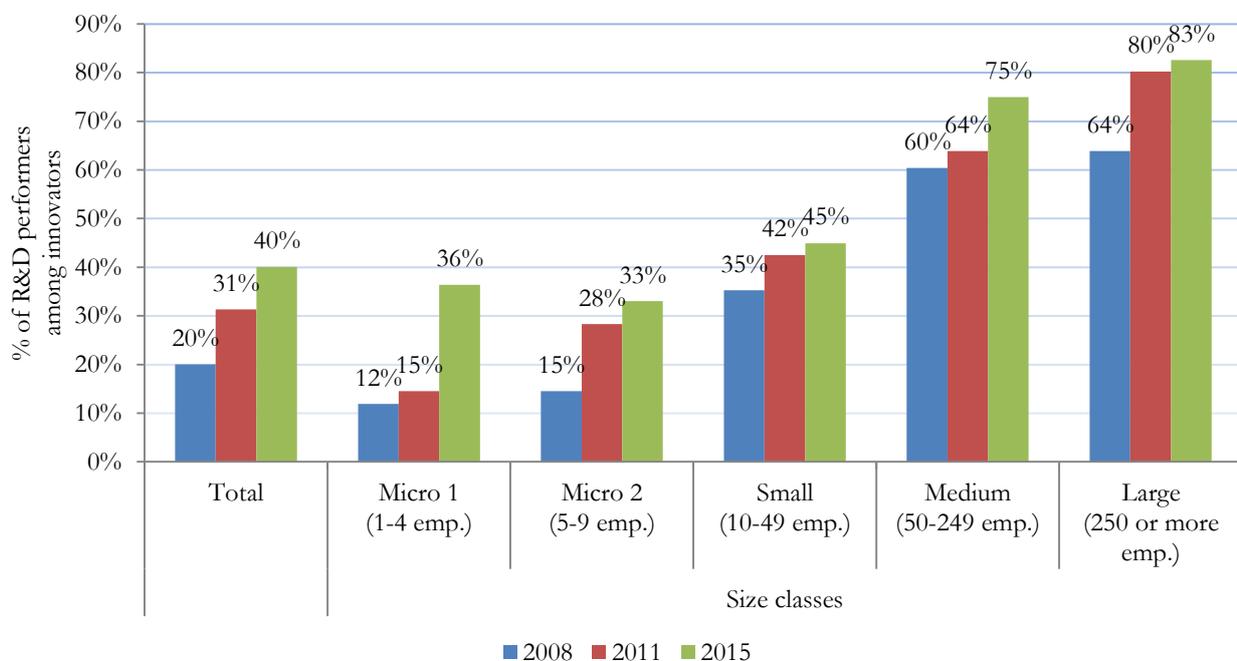
Source: MET sample survey, waves from 2008 to 2015.

The breakdown of this information by size class displays that this trend follows from the behaviours of micro-, small-, and medium-firms. Indeed, within these groups of business activities the average effort in research and development have been rising (almost) constantly since 2011. On the contrary, large companies exhibit the opposite trend. The evolution of the average expenditure in R&D

associated with this category of firms delineates a decreasing tendency by suggesting that, on average, large organisations with more than 250 employees prefer to wait the macroeconomic rebound before exerting further efforts in expensive research and development activities.

Finally, a relevant consequence of the crisis lies in the way Italian firms changed their mode to carry out innovative activities. As a matter of fact during the 2008-2015 period the share of innovators undertaking R&D projects have been steadily increasing, passing from 20% to 40%. Moreover this tendency is not bound to a specific group of companies, but it is widespread across all the size classes. As such, even micro-size innovators endeavoured to improve their technologies with codified R&D. This implies that business activities have started to realise that innovations require the support of codified knowledge to constitute a competitive advantage over rivals. This evidence is even more important considering the traditional way whereby Italian firms used to innovate. As a matter of fact, for decades, the innovation mode of Italian firms have been based upon informal research activities, such as learning-by-doing. However, the trend pointed out in Figure F.7 marks a deep change in companies' behaviours for a larger and larger share of innovators undertake R&D activities to improve their technological knowledge.

Figure F.7: R&D performers among innovators



Note: Data refer to industrial firms. The height of the bars represents the share of businesses undertaking R&D activities among innovators. Innovators include all the firms that have introduced at least one type of innovation during the reference period of the survey wave. The types of innovation accounted for embrace the introduction of new products, the introduction of new production processes, and the implementation of new organisational/managerial/marketing practices.

Source: MET sample survey 2008, 2011, and 2015.

In the end, we can say that the crisis has acted on firms' innovative activities in different ways. To begin with, the uncertainty generated by the turmoil on domestic and international markets and the shortage of resources to whom companies could access dampened both the propensity to innovate and the propensity to improve technological knowledge by means of codified R&D activities. The macroeconomic fallouts hit harder the smallest organisations, in particular those with a sufficiently complex structure (5-49 employees). Moreover, the lack of an adequate aggregate demand redirected firms' preferences towards process and organisational changes. Indeed, the introduction of new varieties of products entailed a disproportionately high risk that could undermine the probability of survival. On the contrary process and organisational innovations represented a safer way to buffer external risks. The protraction of the recession for more than few years, however, spurred many firms

to change their attitude towards anti-cyclical innovative strategies. The outbreak of the ‘sovereign debt crisis’ has questioned the relevance of passive strategies aimed exclusively at the minimisation of total costs and risks and framed in a stagnant domestic economy. In this respect, data show a general rebound in all the innovative indices starting from 2012-2013 through to the most recent years. This rebound is not only linked to the increment in the propensity to undertake innovative strategies but also to the amount of resources that the surviving organisations devote to these activities. Furthermore, the crisis has acted on the mode innovation activities are carried out. As already underlined in the descriptive statistics’ chapter the Italian firms’ innovation has often been labelled as ‘without R&D’, due to the lack of codified research projects underpinning the implemented technological changes. Nevertheless, during the crisis, industrial sectors witnessed a constant increment in the share of businesses undertaking R&D activities among innovators, thus increasing the importance of innovations backed by solid scientific results.

All in all, then, the Italian industrial system that exits the recession is more innovative than the one that entered the crisis period, even though this outcome has been produced at the expense of many organisations that did not survive. In this sense, then, firm-level analyses highlight the presence of deep changes in the industrial structure. At the same time, these deep changes have to be coupled with an extremely heterogeneous framework. Hitherto, it is not clear whether these dynamics have brought about a cleansing effect on the Italian economy. Nevertheless, it is important to consider that the rebound started in 2011 represents a signal for a new attitude towards innovative activities. The fact that this new trend has not yet been detected by macroeconomic aggregates is largely due both to the high mortality rate and to the difficulties faced by companies undertaking these strategies. As a matter of fact many organisations struggle in investing a large amount of resources in R&D or in innovating persistently over a prolonged period of time. Nevertheless, if properly underpinned by policies, this new attitude towards innovative activities may form the basis for a new growth path.

7.1 APPENDIX: FIRMS AND FISCAL POLICY 2008-2015 IN ITALY⁴²

Italian fiscal policy towards enterprises in the period 2008-2015 (the time span considered in this work) was marked by several changes and three major aspects.

A first aspect is represented by the significant reduction of IRES nominal tax rates, tax on business income, decreased in 2008 by 33% to 27.5%.

A second strategy was based on the reduction of the existing tax advantage in favour of credit capital over equity. This was the case with the introduction of the so-called ACE (Allowance for Corporate Equity), namely the tax exemption of profits allocated to equity under specific mechanisms. The measure, realized in the years of the great crisis and in a country characterized by a low corporate profitability, recorded anyway a significant use. The ACE taxation is implemented from the tax period 2011. As far as IRES entities are concerned, during the 2014 tax year 279,632 companies (out of 1,122,215 eligible) have been entitled to the deduction of ACE. There was a substantial increase (+ 7.6%) over 2013. Nonetheless the main benefits were for the financial sector (near 40% of the benefits) while the manufacturing sector benefited only of 2,9 billion euros (mainly larger firms).

Finally, the third line of intervention was on IRAP: after an initial slight reduction in rates (from 4,25% to 3,9% in 2008), the focus was on the reduction of the tax base, with particular reference to the elimination of labour costs from the sums hit by taxation.

Although the impact of fiscal policies on business choices is expected to be significant, a microeconomic estimate cannot be proposed in the previous econometric strategy considering that the main variable affected by the transformation of tax rules over the period and represented by labor cost also reflects other firm level issues and does not uniquely identify the effect of interest.

Table F.1: Fiscal policy and firms' relevance 2008-2015

Year	Variation in tax base		Variation in tax rates	Other main fiscal measures
	Increasing	Reducing		
2008	IRES (profit taxation): - limit on the deduction of interest expenses: 30% ROL - cancellation of accelerated amortisation - taxation of 5% of dividends in the consolidated financial statements	IRES: - Increased share of capital gains on shareholdings (PEX) from 84% to 95% - Tax deductibility 10% of IRAP paid	Reduction IRES from 33% to 27.5% IRAP from 4.25% to 3.9% Increase	

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Year	Variation in tax base		Variation in tax rates	Other main fiscal measures
	IRAP: - binding rules on values estimation (from balance sheets)	IRAP: -	IRES: Additional Robin Hood Tax 5.5% per Energy Sector	
2009/2010			Increase IRES: Additional Robin Hood Tax from 5.5% to 6.5% Energy Sector	IRES Tremonti-ter: deductability of 50% of new Investments in machinery from the profits
2011		IRES: introduction of ACE , deductibility of profits reinvested in the firm's equity, it reduces or even eliminates the fiscal advantage of debt finance, thereby encouraging firm's capitalisation	Increase IRES: Additional Robin Hood Tax from 6.5% to 10.5% Energy Sector	Tax credit R&D Tax credit – employment in southern regions IRES Repeal of time limits for losses compensation
2012		IRES: Deductibility (partial) of labour cost from IRAP basis.		Tax credit for high skill employment
2013	IRES Reduction of deductibility for cars' expenditures	IRES: Deductibility of 30% IMU on production real estates.	IRES: extension of Robin Hood Tax	
2014	IRES: Deductibility of IMU on production real estates from 30% to 20%.	IRES: Increase of notional rate for ACE (from 3% to 4%) IRAP: Increase of deductibility (mainly related to employment increase)		
2015		IRES:	IRES: repeal of Robin	Tax credit R&D

Year	Variation in tax base		Variation in tax rates	Other main fiscal measures
		Increase of notional rate for ACE (from 4% to 4.5%) IRAP: Full deductibility of labour cost from IRAP basis.	Hood Tax (not compliant with constitutional rules)	Patent box for intangibles' income Fiscal forfeit for new micro entrepreneurs

8 CONCLUDING REMARKS AND POLICY SUGGESTIONS

The Italian policy for industrial competitiveness pursued an extensive variety of objectives and instruments in the last decades. Many instruments and specific goals have been tested on extensive scale, even with a large amount of financial resources, and generally with disappointing views on the achieved results.

The underlying rationale behind the present analysis is that an effort for enhancing the effectiveness of the policy design –within a general framework to support the main drivers identified by the literature– could be oriented to the identification of more specific targets in terms of firms’ characteristics reached through a “granular” specification of the main drivers of competitiveness and their interaction with the heterogeneous population of enterprises. Our analyses stress that an influential shortcoming of Italian micro-sized firms lies in their innovative capacity, rather than only in their large diffusion. However, our findings seem to confirm the existence of ongoing restructuring processes undertaken by an increasing number of companies, translating into a repositioning and a strategic upgrading along the production and market segments.

Our contribution was mainly oriented to deepening the role of the different drivers of competitiveness of Italian industrial companies as well as offering an analytic and disaggregated analysis of the elements characterizing their business activity in the Great Recession. In general, this effort confirmed the critical role played by knowledge-creating activities, such as R&D and innovations, as drivers for external competitiveness highlighting, however, several relevant dimensions of heterogeneity.

In what follows we summarise the main evidence at the aggregate level and present a synthesis of the empirical results with the associated policy suggestions.

Italy has been suffering from a slow-growth trend that can be traced back since the 90s, long before the outbreak of the global recession. This dynamic might reflect many factors, including its lower openness to the international environment (even in comparison with other European countries of similar size) and the resulting limited exposure to the beneficial effects of global integration. This gap does not seem to stem from a lower degree of import penetration and export propensity (notwithstanding a significant gap with Germany), but rather from a reduced involvement in the international productive and financial processes.

Since 2010, the long-lasting decline of Italian export shares ceased, with the value of Italian exports experiencing a positive growth, roughly in line with the one for Germany, and even higher than other relevant peer economies such as France, UK, the Netherlands, and Belgium. This trend has been positively affected both by the geographical composition of the Italian export markets and by the favourable world demand for products that are part of the Italian industrial specialisation. In this regard, it is worth emphasizing, however, that the Italian sectoral trade specialization has been going through a set of structural changes since the arrival of the new millennium. In particular, the comparative advantages of the Italian industry in traditional low-tech industries progressively dwindled, while, at the same time, the specialization of medium-technology products has been strengthening. In recent years, some non-traditional sectors, such as “Pharmaceuticals” and “Motor vehicles”, have significantly added on their relative weight over the total export composition. Furthermore, many traditional “Made in Italy” sectors (“Foods and Beverages” and “Textiles and Apparels”, among others) have increased their importance in terms of shares of total exports. These dynamics may be backed by an intra-sectoral restructuring following from a repositioning of a large number of Italian firms on market segments characterised by higher value-added levels (a consequence of which can also be pinpointed by the observed discrepancy between volumes and values of total exports).

One of the most discussed weaknesses of the Italian economy is linked to its low and stagnant labour productivity. Although negatively affecting the aggregate performance, productivity dynamics have

not translated into a significant loss of price competitiveness with respect to the other major Eurozone countries, probably because offset by a significant wage moderation, as well as by the prudent pricing strategies adopted by many Italian firms. Once the dynamics of labour productivity are broken down by size classes, a large degree of heterogeneity emerges among firms. In particular, the overall negative dynamics turn out to follow almost exclusively from the productivity of micro-sized (1-9 employees) and large (>250 employees) enterprises, ranking in the last positions if compared with the main European peer economies. Conversely, the overall picture significantly improves for firms above ten employees, with the class 20-249 employees that even outmatches other European counterparts in terms of productivity levels and recent growth trends. As such, our analyses suggest that the main weakness for the Italian economy has not to be traced back to the excessive number of micro-sized firms (whose share is comparable to France and Spain), but rather to their technical inefficiency compared to the micro-firms of other countries. The latter is strictly related to poor performances in terms of innovative behaviours, human capital absorption, and degree of international openness. At the same time, the analyses of the main non-price competitiveness indices by size class suggest that, excluding micro-sized firms, Italian trends are not far from other main European economies.

The analysis of firm-level data confirmed the high degree of heterogeneity of the Italian system and the well-known differences between internationalised and domestic companies along a wide range of structural, behavioural and performance dimensions (internationalised companies are typically larger, more productive, and more innovative than domestic firms). Since the outbreak of the crisis, data highlight a significant growth trend in terms of both extensive and intensive margins of export. The second wave of the crisis, characterised by a drop of the Italian domestic aggregate demand, has pushed an increasing number of firms to look abroad for new survival opportunities, especially micro-sized firms. Nevertheless, many of these companies turned out to be extremely weak and unable to sell persistently on foreign markets or to increase their exported sales, thus, negatively affecting the overall aggregate performance.

Obviously, internationalisation is a heterogeneous phenomenon itself and its different forms entail strategies associated with distinctive characteristics and behaviours. In particular, increasing complexity in the form of internationalisation is associated with higher degree of persistence on foreign markets and requires more complex structures to accomplish a wider range of tasks (e.g. knowledge of institutional and legal aspects of foreign countries, higher technological competition, etc.). To this extent, the more complex is the form of internationalisation the higher is the propensity to undertake innovative activities, to hire high skilled human capital and dedicated management.

On balance, the analyses of sample survey data have shown that, whilst size and productivity play a key role for external competitiveness, there are also other fundamental aspects triggering superior performances. In particular, a non-negligible part of heterogeneity stems from firms' strategic profiles, technological capabilities and proactive behaviours, especially innovative activities. In this regard, we document a decreasing diffusion of the "traditional" Italian model characterised by incremental innovations without R&D activities moving towards a more integrated model. Moreover, after an initial collapse in the share of innovative firms, the Italian industrial system has been witnessing a gradual rebound in the diffusion of proactive firms after 2010-2011. In some of these cases, such as R&D activities, the share of firms involved in dynamic strategies in 2015 has even overtaken its pre-crisis value.

Within this framework, the empirical analysis employed appropriate econometric techniques to correct the estimates from undesired confounding effects and isolate the drivers of external competitiveness with a specific focus on firms' behaviours that have a strategic role for their own business. The set of results is extremely wide and deals with a significant number of dimensions that enrich the existing literature and provide nontrivial suggestions for future policies. Coherently with the main interpretations on the Italian international performance, and given the aforementioned caveats in the analysis undertaken, the main findings and policy suggestions can be grouped into four main areas of contents.

Productivity

We confirm the critical role played by productivity for international competitiveness, which is paired with higher likelihood of internationalisation: a one-standard deviation increase in productivity is associated to a 1.5% higher probability of export. This evidence is consistent with the literature emphasizing a self-selection of companies in the international markets and with the descriptive statistics showed. Moreover, productivity has a critical impact on firms' international performance (i.e., intensive margins) and on the decision to exit the foreign markets (+4% export sales growth and -2% probability of going back domestic). This is a critical issue since firms' exit from international markets, as documented by aggregate descriptive statistics, has been extremely sizable (roughly 20% of internationalised companies between 2011 and 2014) even in times of relatively low domestic demand.

However, once accounted for persistent characteristics that do not vary over time (including the higher average productivity of some companies), productivity is found to be largely insignificant in explaining the change in firms' exporting status for domestic enterprises. The new entry into international markets, also in absence of R&D and innovation, has a particularly virtuous effect on sales performance. This phenomenon emphasises the role of the continuity of dynamic actions as drivers of competitiveness.

In the light of our findings, productivity represents an essential driver for the success and the permanence on the international markets, but is not found to be a significant driver of new internationalisation choices (i.e., new entrances). In this regard, policy measures should account for such a heterogeneous effect differentiating between interventions aimed at increasing the number of internationalised companies (a relevant issue for the growth of competitiveness through learning-by-exporting mechanisms) and the measures oriented to strengthening of the international position and performance of previously-internationalised companies.

Research and innovation

On the top of structural characteristics, a prominent effect is found for firms' strategic behaviours and investment in dynamic strategies. The introduction of innovations, the involvement in R&D projects, as well as undertaking new investments, induce a significant effect on export strategies (roughly +2% in export probability) and performance (innovations induce on average a 8%-increase of export sales growth).

The introduction of innovations is even more important in reaching extra-EU destinations and in affecting firms' switching strategies; i.e., entrance (+2.3%) and exit (-8.5%) from the international markets.

On the top of their direct impact, there are significant cumulative effects of dynamic strategies. First, the integration of innovation and R&D activities implies *premia* on both the extensive and intensive margins of export. The coefficients of innovative strategies paired with R&D investment is two-to-three times larger than isolated innovations (4.1% vs 1.7% in the probability of export, and +11.7% vs +6.6% in export sales growth). Moreover, the path followed by the set of dynamic strategies undertaken in the past (adding or reducing the set of strategies, i.e., upgrading/downgrading paths) has additional effects on firms' international attitude (roughly, +5% probability of exporting).

Among the different types of innovations, new products dominate other forms of innovativeness (process or organisational-managerial), especially in case of previously non-exporting companies (4%-higher probability of exporting). This is because new products are the main form of innovation which is not reflected in the level of productivity. However, we find process and organisational innovations to have an additional indirect effect on export by boosting firms' productivity (+2% productivity growth, +15% if based on matching techniques), while the introduction of new products does not seem to be linked to any productivity growth.

Innovative strategies are found to have disproportionate effects for the international performance of (originally) less productive and small companies: 17%- and 21%-increase in export growth compared to 7%- and 8%-increase for more productive and larger firms, respectively. This result candidates

innovative strategies as a potential tool to fill the gap between large/productive companies and the set of less structured firms, that are ideal targets for policy measures.

A simultaneous equation model (bivariate probit) also emphasizes the main determinants of firms' innovativeness. In this regard, structural characteristics are significantly affecting the introduction of innovations, especially for larger, younger, and more productive companies. The existence of R&D projects is clearly correlated to huge increases in the probability of introducing innovations. Importantly, this effect is not limited to the investment in R&D performed within the firm (internal R&D), but extends to firms outsourcing R&D activities, even though with smaller magnitudes (+8% vs +27% probabilities). Another important factor in driving firms' innovativeness is related to the operating environment of a firm, such as the affiliation to a corporate group (+5%) and the establishment of close relationships with other domestic companies (i.e., networks, +4.5%). Finally, financial constraints are found to significantly affect a firm's capacity to innovate and the establishment of close ties with the main bank is documented to be extremely important in reducing informational asymmetries penalizing innovative SMEs.

In terms of policy recommendations, we confirm the critical role played by R&D and innovations (new products directly influencing international competitiveness, and process/organizational innovations operating through higher productivity growth). Our analysis sheds lights on some interesting factors. First of all, we show disproportionate effects of dynamic strategies for more fragile (smaller and less productive) companies that are paired with a premium linked to integrated strategies (innovation and R&D) and the documented need to reduce the discontinuity of proactive behaviours, typically characterizing more fragile (and often smaller) companies. These issues should be all taken into account when designing specific policies.

Similarly, financial constraints severely limit the activity of potentially innovative firms. Their role goes beyond generic frictions in the credit market, such as informational asymmetries affecting the entire set of relationships of SMEs with the banking system, and is dramatically exacerbated in presence of direct funds to innovative projects (characterized by higher uncertainty, opacity, and typically associated to investment in immaterial capital that cannot be pledged as collateral).

Firm size and corporate groups

The dominant view on the Italian productive system emphasise the excessive number of micro-sized companies within the economy, as well as a very fragmented industry paired with a reduced diffusion of large enterprises. Our analyses and the available comparisons allow to draw a more detailed picture of the industrial system.

The few external econometric analyses on firm-level information are not adequately capable of capturing the role of micro-sides companies because mainly based on survey data excluding very small firms from the sample design.

Aggregate descriptive statistics seem to document that the main weakness of the Italian system has not to be ascribed to the excessive diffusion of micro firms (whose share is not far from the one in France and Spain), but rather to their relatively poor performance. Our analysis suggests that the heterogeneity of the set of dynamic strategies adopted leads, even within the same size class, to substantially different economic outcomes and efficiency levels. Moreover, within the class of small firms there is a significant difference between companies below and above ten employees. For the latter (>10), descriptive and empirical evidence emphasises higher performance of Italy compared to other European peer economies.

The econometric analyses always confirm the positive role of size and affiliation to corporate groups (respectively, +3% and +2% probability of exporting). In this regard, however, innovative strategies seem to display disproportionate incremental effects for smaller companies.

Clearly, firms' size cannot be easily implemented as a specific objective for policies, at least not directly. It is however clear from the empirical results that policy measures oriented to the

reinforcement of innovative and knowledge-creating activities, to the reduction of their discontinuity, and the specific financial constraints to their implementation may explicitly help smaller firms that are willing to undertake dynamic paths.

Industrial networks and global value chains

The role played by networks of firms and industrial districts is central in the economic literature on the Italian system. It has been often pushed forward as a factor capable of offsetting the inefficiencies of small firms by allowing to reach a larger scale at the network level compared to the small dimension of the single units. Similarly, firms' involvement in global value chains is often cited as a determinant factor in explaining success and weakness on the international markets, depending on their diffusion and the different modes of participation of the firms involved.

Our analysis confirms the role of local networks in increasing firm innovativeness, through the opportunity of knowledge exchanges, as well as the effect of GVC belonging. Our findings provide evidence of a positive average impact of the involvement in GVCs, but highlights at the same time relevant heterogeneities in how GVC participants fared the crisis. While high-skill suppliers with stable international connections (i.e. "relational GVCs") display a significant propensity to engage in innovative activities and R&D projects, other modes of GVC participation have no premium compared to domestic companies. This heterogeneity is also reflected in differential productivity and sales growth. Compared to the pre-crisis trends, we document a severe demand shock for low-skill and subordinated firms, while relational GVCs appear to be somewhat sheltered from the effects of the crisis. Overall, while upgrading in GVCs has to operate through the stable implementation/increase of R&D and innovative activities, the strengthening of local networks can be seen as a positive element for the reinforcement of existing strategies. Overall, upgrading dynamic strategies come out as the critical factor also within the district and GVC framework, even above sector-specific components.

All in all, provided that our analysis does not specifically explore the effect of macroeconomic policies and structural reforms, the key elements in terms of policy suggestions to be derived from our work and estimates can be summarized as follows:

- the support to firms' R&D and innovation should keep being one of the main focus of policies for competitiveness. The choice of instruments has to explicitly consider needs and constraints of the targeted businesses;
- an essential issue of the work is represented by the research of differential effects due to the integration of three fundamental dynamic strategies (R&D, innovation and internationalisation), whereby the effect of integrating dynamic strategies by firms following a path of modernisation that is not yet completed appears to be very significant. The completion of this strategy and the integration of activities is characterized - in our view - as one of the main goal of a strategy to support firms' growth and to improve international competitiveness. Policy measures must be specifically targeted to these goals;
- on the same logical trail, the elimination or reduction of discontinuity in strategic business activities (for example with reference to the intermittent presence on foreign markets or with discontinuous innovative activities and R&D), in particular of smaller enterprises, seems to represent an "effective" policy target. The discontinuity can be directly influenced by appropriate and specific policy measures;
- financial constraints still constitute a substantial limitation to the growth of the most dynamic companies and to the improvement of their development strategies; paradoxically this bond is stronger for companies oriented towards innovation and R&D than the static ones because of the significant market and technological risk and for the higher credit demand: access to credit (as well as other financial instruments) could usefully have a specific orientation towards innovative projects, while the practice of current policy for credit access and equity support is more in the sense of general targeting;

- the role of human capital as a constraint and as a driver for competitiveness weakly emerges in previous estimates and elaborations even if not detailed. However, it is clear that strongly focused policies on R&D and innovative processes cannot ignore knowledge growth and facilitate firms' efforts in human resources improvement.

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10 DESCRIPTION OF THE FIRM-LEVEL DATASETS

10.1 ISTAT 'RAPPORTO SULLA COMPETITIVITÀ DEI SETTORI'

The dataset has been set up by ISTAT for research purposes on the basis of the Frame-SBS information system, including firm-level structural and economic information for each of the over 4.4 million Italian enterprises. The database merges information on structural characteristics (employees, sector, geographical region, corporate group belonging, etc.) with relevant economic variables (including value added, labour cost, export, import, etc.).

Overall, analyses have been carried out by taking advantage both of the cross-sectional population of manufacturing firms in 2011 and 2014 and of the panel of firms alive in the aforementioned years.

In order to give an idea of the extent of the phenomena, the overall 2014 population amounts to 396,422 firms including 87,890 exporters and 308,532 non exporters.

Table H.1: Number of manufacturing firms by export status, size class and year

	2011			2014		
	Non exporters	Exporters	Total	Non exporters	Exporters	Total
Micro (1-9)	307,333	43,394	350,727	283,208	45,278	328,486
Small (10-49)	28,921	35,359	64,280	24,431	33,959	58,390
Medium (50-249)	986	7,864	8,850	865	7,484	8,349
Large (250 or more)	29	1,235	1,264	28	1,169	1,197
Total	337,269	87,852	425,121	308,532	87,890	396,422

Table H.2: 2014 population: details by export status and size class

	Share of total firms (%)		Employees per firms (median)		Share of total firms elder than 10 years (%)	
	Non exporters	Exporters	Non exporters	Exporters	Non exporters	Exporters
Micro	91.8	51.5	2.0	4.0	58.6	62.0
Small	7.9	38.6	13.7	17.0	65.4	80.3
Medium	0.3	8.5	69.6	81.8	66.2	86.3
Large	0.0	1.3	371.0	415.0	75.0	87.2
Total	100.0	100.0	2.0	9.0	59.1	71.5

10.2 MET SURVEY

MET survey's population of interest refers to the enterprises belonging to all the size classes operating within Industry (construction excluded) and Production Services sectors (overall 38 NACE Rev.2 3 digit sectors)⁴³. The survey hinges on a stratified random sampling: within each stratum firms show the same probability of extraction without re-introduction. Strata are identified by intersecting three dimensions: the NUTS 2 region, the size class in terms of employees (micro-sized firms included), and the NACE Rev.2 sector at 3 digits⁴⁴.

The employed calibration estimators allow the survey, under predetermined circumstances, to reproduce known population parameters as well as to recover possible sample biases following from the (non-random) missing responses' distribution. The computation of the calibration estimators takes also advantage of a set of auxiliary information (other than the one employed to identify the strata) drawn from the population of interest. This auxiliary information constitutes a further binding constraint the final sample has to reproduce. All the constraints are drawn from ISTAT Italian Statistical Business Register (ASIA) while the calibration procedure makes use of an ad-hoc iterative algorithm. As for the longitudinal part of the sample, a specific calibration estimator has been computed to account for firms interviewed in two succeeding waves.

Table H.3: Composition of the MET database by firms' size class.

	2008	2009	2011	2013	2015
Micro (1-9)	38.4%	60.0%	61.6%	48.1%	46.9%
Small (10-49)	38.4%	26.0%	24.7%	33.6%	34.6%
Medium (50-249)	19.5%	10.5%	10.6%	13.5%	14.7%
Large (>250)	3.00%	3.50%	3.10%	4.80%	3.70%
# observations	24,896	22,340	25,090	25,000	23,071

On top of that, starting from the wave 2009 the sampling scheme employs Bayesian techniques in order to ensure high precision estimates on a selected range of topics that represent the core part of the survey (R&D, innovation and internationalisation strategies among others). These techniques draw on a tree-based classification model able to detect, in the preceding wave, the strata showing higher rates of enterprises undertaking these relevant activities. This procedure has required further constraints leading to an oversampling of the targeted strata. Clearly, such sample bias is accounted for during the calibration estimator's procedure.

Until the wave 2013 (included), interviews were carried out by means of *Computer-Assisted Telephone Interview* (CATI) techniques. *Computer-Assisted Web Interview* (CAWI) techniques were marginally employed either upon firm's request or to interview large enterprises.

43 For detailed description of the methodologies employed to the design and carry out the sample survey refer to: R. Brancati (ed.) (2015), *Le strategie per la crescita. Rapporto MET 2015*. Meridiana Libri: Roma.

44 The MET survey project is designed and coordinated by a prestigious scientific committee whose members include: Raffaele Brancati (MET Scientific Director), Giorgio Alleva (full professor of Statistics at the La Sapienza University of Rome who has been an active member of the committee from the beginning of the MET survey project until the wave 2015; he resigned from this role as soon as he has been appointed president of the Italian National Institute of Statistics, ISTAT), Alberto Zuliani (full professor of Statistics at the La Sapienza University of Rome, former president of ISTAT), Giovanni Barbieri (ISTAT executive), Piero Demetrio Falorsi (member of ISTAT as the executive for methodologies) and Marco Centra (executive for methodologies at ISFOL - Institute for the Development of Vocational Training of Workers).

Starting from 2015, MET has internalised a large part of the data collecting process by carrying out CAWI interviews, whose proportion has reached the 74% of the wave. Overall, more than 100,000 firms have been sampled and asked via mail to participate to the MET survey. Nevertheless, the remaining 26% of the survey (roughly 6,000 interviews) have been conducted via CATI interviews.

10.3 BALANCE-SHEET DATA

In our project we make large use of balance sheet data between 2006 and 2014. The data are of public source (the same of Aida BvD) provided by Crif-Cribis D&B⁴⁵ (a leading company in the field of firm level data and financial ratings). Balance sheets contain a large array of information (such as structural characteristics, capitalisation, performance indicators, indebtedness) that, once aligned with the MET survey, allows to span a wide set of firm-level characteristics. It is worth reminding that such data (especially when the breakdown required is very detailed) are available only for “società di capitali”, roughly 50% of the original sample. Any distortion is however purged through appropriate econometric techniques or sampling weights.

⁴⁵ For more information see: <http://www.crif.it/Pages/default.aspx>; <http://www.icribis.com>