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A tale of two countries: Regional Misallocation in Italy and Spain

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1. Introduction

Total factor productivity growth is deemed to depend, almost equally, on technological adoption and on the efficiency with which production factors are allocated across firms. In the last decade, and especially since the definition of a novel methodology with easily-accessible data requirements, the degree of inefficiency in resource allocation, referred to as 'misallocation', has attracted increasing interest for the large first-order welfare effects that its reduction would imply. While the magnitude of allocative inefficiencies is generally larger in developing countries, it is indeed deemed to have sizeable effects also in richer and more productive economies: in the US for example, misallocation has been recently found by Baqaee and Farhi (2020) to account for a 20% loss of economy-wide (*i.e.* including all sectors) aggregate TFP.

The present article proposes a comparative analysis of factors misallocation in Italy and Spain, performed at different subnational levels (NUTS1, NUTS2, and employment areas), with a threefold aim: first, to verify the external validity of previous findings by extending to the Spanish case the thorough analysis applied to Italy by Calligaris *et al.* (2018). Secondarily, by focusing on misallocation at sub-national level and evaluating where inefficiencies concentrate in the two countries, it aims at quantifying which share of the aggregate productivity, allocative efficiency and gap between the two countries, can be explained at the local level or by specific areas. Finally, by exploiting recent data availability, it aims at updating previous evidences on both countries, up to the first year of the pandemic. In particular, it extends, in both time and space, the work of Calligaris *et al.* (2018), exploiting firm-level data to indirectly quantify the within-sector variance of total factor productivity revenues (TFPR). The hypothesis, that will be tested in the second part of my work, is that in Spain the correlation between the misallocation 'markers' and its intensity should be similarly significant as those obtained for Italy by Calligaris *et al.* (2018). Differences in sign and significance of the markers coefficients estimated for the two countries would point at the country-specificity, or generality otherwise, of the results. Moreover, the present article will deepen its regional perspective by adding to the NUTS1 level analysis proposed by Calligaris *et al.* (2018), estimates at the NUTS2 and employment areas level of geographical aggregation while also including controls for the consideration of the role of agglomeration economies. Finally, since as expressed by Barrero *et al.* (2020), Covid-19 is also a "reallocation shock", and given that our data reach the end of 2020, the first effects of the pandemic in terms of misallocation in the two countries will be evaluated.

The analysis is expected to quantify the magnitude and to draw conclusions on the trends and common factors associated with factors misallocation in the two countries at national

and regional (NUTS1, NUTS2 and LMAs) level, and to suggest grounds for policy-oriented discussions on the paramount productive bottlenecks to address.

2. Reference Literature

The term misallocation can be intended in numerous ways: it may refer to distortion affecting the economic agents' decisions on how much to consume or work, or on the amounts of capital and labour to use in production or to invest. A more specific definition of misallocation, at the core of this article, is one that assumes the amount of labor and capital in the economy as given, and refers instead to the most efficient way to allocate said quantities across heterogeneous producers. The hypothesis behind this definition, is that in absence of distortions, labour and capital should be allocated by markets to producers up to the equalization of their marginal products.

Misallocation has mainly been quantified in aggregate single or multiple countries settings, with scant exceptions on within-country regional analysis, notwithstanding reasons, both theoretical (spatial frictions, market segmentation and agglomeration economies) and evidence-based to expect location to affect the efficiency of factors allocation across firms. The latter include the works of Fontagné and Santoni (2019), who produced evidences of a negative correlation among misallocation intensity and population density in French (NUTS3) provinces, and that of Calligaris *et al.* (2018), who revealed the existence of regional differences in the extent of misallocation in Italy, also dependent on firms' characteristics (share of intangibles and ownership structure), that constitutes the closest analogue to my work.

To shed further light on the role of firm's location, innovativeness, ownership structure and agglomeration, I thus propose to jointly test it in Italy and Spain, the latter being a second Southern European country that shares with the former a number of characteristics that are expected to be corralted with misallocation: large shares of family-owned firms (Binda and Colli, 2011), below-average productivity growth (Mas *et al.*, 2008, Bauer *et al.*, 2020), large geographical concentration of production (Cainelli *et al.*, 2018; Cainelli, 2008; Boix, 2009), low financial-market's development and equity attractiveness (Groh *et al.*, 2010) and institutional quality (García-Santana *et al.*, 2020).

To the author's knowledge there is only one article specifically comparing Italy and Spain in terms of productivity, which the present article completes under a different perspective: Cainelli *et al.* (2018) analysed the role of spatial agglomeration on productivity in the two countries, controlling for their position in Global Value Chains. Their model do not study misallocation, such that this work will complement it, while being informed by their findings and empirical strategy.

3. Methodology

Hsieh and Klenow (2009) developed a model (HK) of monopolistic competition à la Melitz (2003), where heterogeneous firms, differing in their physical TFP (A_i), face the same marginal cost of inputs and distinct firm-specific input constraints. In particular, they analyse the effects of two types of distortions faced by a firm i in sector s: a capital wedge $\tau_{K_{si}}$ affecting

the relative marginal revenue product of one factor with respect to the other, and an output wedge $\tau_{Y_{si}}$ affecting the marginal products of both factors, human and physical capital, by the same proportion. Their model, shows sectoral (log)TPF to be negatively correlated with the dispersion in revenue total factor productivity in each sector s which can be used to proxy the dispersion in marginal revenues products and is in turn shown to be proportional to wedges.

By collecting data on total revenues, labor and capital inputs, the HK methodology allows to calculate and plot the evolution of distortions in factors allocation across and within sectors, through the ratio among revenue total factor productivity for firm i in sector s at time t and the average TFPR by year (t) and sector (s), $\frac{TFPR_{ist}}{\overline{TFPR_{st}}}$. A value above one for this ratio would indicate an inefficiently small firm size (or level of factor utilisation) and over capitalization/size for values below unity.

We refer to Calligaris *et al.* (2018) to estimate aggregate (eq. 1), sectoral (eq. 2) and regional (or by size-group) (eq. 3) misallocation for manufacturing sectors in the two economies, respectively as:

$$Var(TFPR) = \sum_{s=1}^{S} \frac{VA_s}{VA}(TFPR_s - \overline{TFPR})^2 \tag{1}$$

$$Var(TFPR_s) = \sum_{i=1}^{N_s} \frac{VA_{si}}{VA_s}(TFPR_{si} - \overline{TFPR}_s)^2 \tag{2}$$

where N_s is the number of firms in sector s.

$$\begin{aligned} Var(TFPR) = & \underbrace{\sum_{g=1}^{G} \frac{VA_g}{VA} \sum_{s=1}^{S} \frac{VA_{gs}}{VA_g} \sum_{i=1}^{N} \frac{VA_{gsi}}{VA_{gs}}(TFPR_{gsi} - \overline{TFPR_{gs}})^2}_{\text{within-group: weighted av. of the within-group sq. dev. from the group mean}} + \\ & + \underbrace{\sum_{g=1}^{G} \frac{VA_g}{VA} \sum_{s=1}^{S} \frac{VA_{gs}}{VA_g}(TFPR_{gs} - \overline{TFPR})^2}_{\text{between-group: weighted av. of the group means from the overall mean}} \end{aligned} \tag{3}$$

With (3), a within- and between-group decomposition of the dispersion in sectoral $TFPR$ is seized to analyse misallocation within geographical areas and/or firms' size groups, for which the equation is estimated per both these g group kinds.

The econometric analysis of misallocation markers suggested by Calligaris *et al.* (2018) will be applied in turn to the pooled and the individual-country samples, in order to evaluate the country-specificity of the correlation between firms' characteristics and aggregate, regional and sectoral misallocation:

$$ln\left(\frac{TFPR_{istn}}{\overline{TFPR_{stn}}}\right) = \alpha + \beta X_{istn} + \delta_t + \gamma_s + \eta_{istn} \tag{4}$$

where X_{ist} contains the set of firm's (log-transformed) characteristics to analyse (such as age, share of intangibles, ownership type), γ_s are sector specific fixed effects and δ_t a year dummy for common shocks.

A second specification (eq. 5) will also investigate the role of agglomeration economies, by including the term $Aggl_{rnt} = \frac{sum_{k=1}^{K} LU_{krnt}}{Surface_{rn}}$, based on Ciccone *et al.* (1996), Ciccone (2002) and used in Cainelli *et al.* (2018) to capture "the density of local units (LU) operating in the manufacturing and knowledge-intensive business services (KIBS) k sectors", "as a proxy for agglomeration forces arising from the local availability of economic actors in sectors with which manufacturing firms are likely to interact through both market transactions and knowledge spillovers" (Cainelli *et al.*, 2018, p.46). As such, this model will also include regional (alternatively at NUTS1, NUTS2 and LMA level) subscript r.

$$ln\left(\frac{TFPR_{istn}}{\overline{TFPR_{stn}}}\right) = \alpha + \sum_{j=1}^{J}(\beta_j X_{istn}^{j}) + \theta ln(Aggl_{rnt}) + \delta_t + \zeta_i + \eta_{istn} \tag{5}$$

To address endogeneity issues linked to the reverse causality between agglomeration and productivity, the *Aggl* variable is instrumented through historical values and an IV estimation estimation is performed [1].

4. Data

Two Bureau Van Dijk (BvD) micro-datasets, AIDA and SABI, containing information on, respectively, Italian and Spanish firms' balance-sheet, will be used to compute the misallocation measure. The main variables of the model are the cost of labour per worker[2] and the book value of fixed capital net of depreciation[3]. Finally, we use Value Added as a measure of total revenue, and compute the labor shares at industry level through the industry mean of "labor expenditure on value added" measured at firm level. To ensure the correctness and comparability of measures for the two countries, estimations at country level based on Orbis data will be compared with those based on CompNet, a specific database jointly developed by researchers in a number of EU countries to produce reliable and harmonized cross-country analysis. I will not rely fully on the latter database for two reasons: first, its time availability is capped to 2017; secondarily, being a micro-aggregated national indicators database, it would not allow for firm-type nor regional analysis. Sectors will be analysed at 3-digits code of the ATECO 2002 classification, for the sake of comparability with previous researches, such as Calligaris *et al.* (2018). To calculate the *Agglomeration* term in eq. 5, we will leverage data from the ASIA archive (Istat, Italy), the Directorio Central de Empresas (INE, Spain), and Eurostat data on land as in Cainelli *et al.* (2018) for consistency and comparability.

1 The *Aggl* variable is instrumented by two-digits density of local units (LU) in 1993 for the period 1995-2020, and in 2005 for the period 2007-2020, and sector-specific national changes over the period under analysis

2 In AIDA, the variable is called "Costo del lavoro per addetto", while in SABI "Coste laboral por trabajador".

3 For which we use the variables fixed capital ("Totale immobilizzazioni" in AIDA) and "formacion bruta del capital fijo" in SABI), net of depreciation ("Ammortamento immobilizzazioni" in AIDA and "Amortizacion acumulada" en SABI".

5. Expected Results

The research deal with factors misallocation at national and subnational level, with a comparative framework among two Southern countries, Italy and Spain, sharing similar economics features. As such, it is expected to offer insights on the role of different misallocation markers, verifying and extending country-specific previous findings on the role of ownership type, innovativeness and agglomeration economies.

By performing the analysis at different levels of geographical aggregation, it will provide insights on the within-country imbalances in factors' allocative efficiency, assessing how much of the two countries' aggregates are explained at local level, and which areas are the ones deserving more attention.

Finally, on account of the time-span of Bureau Van Dijk data up to the end of 2020, the research will offer some preliminary results of the impact of Covid-19 on the misallocation trends in the two Southern European countries. Notwithstanding the general cleansing effect that crisis are deemed to have, the impact of the pandemic on TFP and factors allocation is hard to forecast, and might differ largely across countries and regions depending on their productive specialization and on the specific public policy issued to face the emergency, given the ambiguous effects that employment and firm protection schemes, supply and demand shocks, and increased uncertainty in financial markets, could have resulted into.

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