Economic Adjustment during the Great Recession:
The Role of Managerial Quality

by

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Abstract: This study investigates empirically how managerial practices have affected macroeconomic adjustment during the Great Recession after the 2008 economic crisis. We start by constructing a country*industry balanced panel data over the 2007-2015 period for eighteen industries in ten OECD countries, which we complement by two indicators: an indicator of management quality at the country level based on the managerial practices categorical scores at firm level from Bloom et *al*. (2012); and an indicator at the industry level for the shocks stemming from the 2008 economic crisis. We then rely on the local projection method pioneered by Jordà (2005) to estimate the direct impacts of country management quality indicators and industry economic shocks as well as their joint impacts, on five variables of interest: value-added, employment, labor productivity, wage per employee and labor share during the Great Recession. We find that, in countries where management quality is higher, production and employment are more resilient during the Great Recession, with less production losses and employment damages, no effects on productivity, wage moderation and a slight increase in the labor shares. It appears, moreover, that this resilience is increasing with the size of industry shocks.

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1. Introduction

The Covid-19 crisis has highlighted the importance of swift reorganisation of tasks and logistics in cushioning economic shocks. For instance, the ability to rapidly implement teleworking, reorganise supply chains and resort to online services to meet social distancing rules and disruptions in deliveries of intermediate goods is crucial in lessening the negative effects of lockdowns on OECD economies. Managerial talent plays a key role in enabling and promoting such reorganisation, contributing to the ability of firms to weather the storm during crises by preserving skills, production and market shares. Aggregating up, the average quality of management in a country can therefore potentially contribute to increasing economic resilience to shocks at the sectoral and aggregate levels as well.

While it is too early to study the effects of managerial talent on resilience to the Covid-19 crisis, useful insights can be drawn from the experience of the Great Recession. In this paper we study the way in which average managerial quality has shaped the response of OECD economies to the financial crisis focusing on its effects on employment and related economic outcomes at sectoral level.

Research has shown that managerial practices vary a lot not only across firms in an economy but also across countries. For instance, Bloom and Van Reenen (2007) and Bloom *et al*. (2009, 2012, 2016) have collected, via firm-level surveys, data on the quality of management for 35 countries which show that the dispersion of managerial quality across countries and across firms within countries is wide. Their approach has been applied by government agencies for collecting management information for benchmarking purposes (see World Management Survey).[1] Using a different approach, the OECD (2019) has gathered survey data on cognitive

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[1] For instance, the US Census Bureau MOPS collects data on managerial practices on a continuous basis and New Zealand, Australia, Canada and Ireland have been using the approach to benchmark managerial practices against those of other countries.

abilities of adults by occupation (including managers) in 33 countries, which also suggests a wide variability across and within countries in the talent of managers.[2]

Several studies have shown the effect that managers can have on firm-level and sectoral productivity outcomes in the medium to long-run (Bloom *et al.*, 2012, 2014, 2016; Syverson, 2011; Giorcelli, 2019). Another strand of research has highlighted the role of managers in efficiently allocating tasks in a firm in ways that preserve, develop and use efficiently human capital and workers' skills, including by maintaining workers' incentives and satisfaction (Bandiera *et al.*, 2007; Burgess *et al.*, 2010; Friebel *et al.*, 2017; Amodio and Martinez-Carrasco, 2018).

However, there has been relatively little research to date on the effects of managerial practices on macroeconomic outcomes during a crisis. Do the responses of value-added, employment, productivity and wages to a deep downturn differ across countries depending on prevailing managerial practices? More specifically, are countries that have on average better managers able to preserve employment levels and the associated human capital in the wake of a temporary demand shock? If so, what are the trade-offs managers can leverage upon, such as wages or productivity, in weathering the shock and ensuring a rebound during the recovery period?

In this paper we focus on these issues using the Great Recession (GR) as an exemplary case study. We rely on a country-industry panel covering 18 industries in 10 OECD countries over the 2007-2015 period and adapt the local projection approach pioneered by Jorda (2005) and further developed by Teulings and Zubanov (2014) to study the covariation of average managerial quality, measured by the World Management Survey indicators, with the response of employment, value-added, wages, productivity and the labor share. In other words, we estimate the extent to which country-industry differences in managerial quality are correlated

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[2] Details in https://www.oecd.org/skills/piaac/.

with differential responses of employment and other variables to the intensity of the demand shocks induced by the 2008 Great Recession.

We find that the quality of management practices was significantly associated with employment dynamics during the Great Recession. On average, countries that had better management levels suffered less employment losses. The difference in cumulated job losses between countries at the top and bottom management quality quartiles has been significant. In better managed countries, employment losses have been contained by limiting declines in production, implementing wage cuts and maintaining productivity levels. As a result, in these countries labor shares have not declined. Moreover, these positive cushioning effects of good management on employment appear to increase with the depth of the shock suffered at sectoral level.

Our paper contributes to three main strands of literature. First, it adds a dimension to the macroeconomic research looking at the interactions between institutions and shocks (Blanchard and Wolfers, 2000; Bertola, 2016; Monteiro, 2017). These authors have looked at the way in which the differential responses of unemployment to demand shocks in European countries have been shaped by differences in labor and product market institutions, such as employment protection, collective bargaining regimes and product market regulation. Managerial culture is closely related to historical and institutional factors, such as industrial structure, the education system and both labor and product market arrangements.[3] The quality of management can therefore be affected by policies that address these underlying factors and our study suggests that this could increase employment resilience during economic crises. Second, it explores the macroeconomic implications of evidence found at the microeconomic level concerning the link between management styles and labor reallocation within firms experiencing exogenous shocks

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[3] For instance, Bloom *et al.* (2010) and Van Reenen (2011) show that managerial practices are affected by the competitive environment in which firms operate.

(Adhvaryu *et al*., 2019). Third, it extends research on the way managerial quality affects the response of economic outcomes to shocks (Wang *et al*., 2016) by looking beyond the productivity dimension and into the channels that lead to these outcomes.

The finding that good management may contribute to smooth out the effect of deep crises on employment is potentially relevant for understanding differences in employment responses to the Covid crisis during lockdowns across countries, beyond influences exerted by other institutional arrangements such as reliance on job retention vs unemployment insurance schemes. It could also be relevant looking forward to gauge the persisting effects of the Covid-19 crisis on employment upon exiting confinement periods via the emergence of new work arrangements reflecting the need for social distancing. While there are obvious differences between the causes and mechanisms underlying the Great Recession and the Covid-19 crises and the policy responses to these crises, our results suggest that good management could have positive effects in the recovery process of both crises through comparable channels.

In the following sections, we start by describing our empirical approach and regression model (Section 2). Next, we describe our international industry-level data, our proxies for managerial quality and the cross-country patterns these data unveil (Section 3). We then report our estimation results and robustness tests, focusing on the association of managerial quality with the time profile of value-added, employment, wages, productivity and the labor share during and after the Great Recession (Section 4). Finally, we use our coefficient estimates to gauge how raising the average level of managerial quality in countries where this level was low in the wake of the Great Recession might have enhanced employment resilience and recovery (Section 5). We conclude by discussing the policy and research issues raised by our findings (Section 6). In Appendix A we record our main estimates in detail, while in Appendix B we also document two set of alternative estimates where we use observed and predicted domestic industry shocks respectively, instead of our preferred USA industry shocks.

2.   **Approach and Model**

2.1.   The local projection method

The local projection approach, as developed by Jordà (2005), is basically a flexible time-series (and panel data) statistical method to estimate the dynamic effects of shocks, or precisely the "impulse responses to shocks", defined as the differences between two forecasts – the first corresponding to a situation with the shock and the second to the same situation without this shock.[4]

Using Jorda's own words in his introduction:

- "Impulse responses (and variance decomposition) are important statistics in their own right: they provide the empirical regularities that substantiate theoretical modes of the economy and are therefore a natural empirical objective…; computing impulse responses based on local projections do not require specification and estimation of the unknown true multivariate dynamic system itself".

- "The advantages of local projections are numerous: they can be estimated by simple least squares with standard regression packages…; they are robust to misspecification of the DGP (Data Generating Process); they easily accommodate experimentation with highly non-linear specifications that are often impractical or infeasible in a multivariate context".

Our approach is a direct application of the local projection method to analyse the dynamic effects of the economic shock (noted SH) induced by the 2008 Great Recession. We look at the size and changes of these effects, over the seven subsequent years (2009-2015) covered in our sample, focusing on four interrelated economic variables: production measured

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[4] In his paper, Jorda shows in details what are the advantages of the local projection approach to compute impulse responses in comparison to the more usual, but less flexible VAR (or VARMA) approaches.

by Value-Added (VA), employment (L) measured by the number of employees, wages (W) measured by the average wage per employee, labor productivity (LP) measured as the ratio of value-added to employees (VA/L), and the labor share (LS) measured as total wage compensation over value-added (L*W/VA). We are also specifically interested on studying how and to what extent these effects vary in interaction with the quality of management practices (noted MQ).

2.2. Model

Following the framework of the local projection method, we posit a system of 35 (=5 variables*7 years) stacked regressions defined as separate linear projections, where the five left hand side dependent variables are the log-changes of our variables of interest (VA, L, W, LP and LS) between 2007 and each of the seven years of our study period (2009, 2010, …, 2015), and the right hand side regressors are simply measures of the 2008 crisis industry-level shocks (SH), country indicators of the average management quality (MQ) in a period before 2008 as well as the interaction between industry-level shocks and country-level management quality (SH*MQ). Denoting respectively the different countries, industries and years in our sample by the indices (c), (i) and (t), the system is specified as follows:

$$\ln(VA_{cit}) - \ln(VA_{ci07}) = \alpha_t^1 SH_i + \theta_t^1 MQ_c + \beta_t^1 (SH_i * MQ_c) + \phi_t^1 + \varepsilon_{cit}^1 \quad \text{Eq1\_VA(t)}$$

$$\ln(L_{cit}) - \ln(L_{ci07}) = \alpha_t^2 SH_i + \theta_t^2 MQ_c + \beta_t^2 (SH_i * MQ_c) + \phi_t^2 + \varepsilon_{cit}^2 \quad \text{Eq2\_L(t)}$$

$$\ln(W_{cit}) - \ln(W_{ci07}) = \alpha_t^3 SH_i + \theta_t^3 MQ_c + \beta_t^3 (SH_i * MQ_c) + \phi_t^3 + \varepsilon_{cit}^3 \quad \text{Eq3\_W(t)}$$

$$\ln(LP_{cit}) - \ln(LP_{ci07}) = \alpha_t^4 SH_i + \theta_t^4 MQ_c + \beta_t^4 (SH_i * MQ_c) + \phi_t^4 + \varepsilon_{cit}^4 \quad \text{Eq4\_LP(t)}$$

$$\ln(LS_{cit}) - \ln(LS_{ci07}) = \alpha_t^5 SH_i + \theta_t^5 MQ_c + \beta_t^5 (SH_i * MQ_c) + \phi_t^5 + \varepsilon_{cit}^5 \quad \text{Eq5\_LS(t)}$$

where (α, θ and β)'s are the parameters of interest in year (t), and the (ϕ and ε)'s stand respectively for year fixed effects and idiosyncratic random effects.[5,6]

The parameters ($\alpha_t^1, \alpha_t^2, \alpha_t^3, \alpha_t^4$ and α_t^5) estimate impulse responses to the 2008 crisis industry shocks (SH_i) on (VA, L, W, LP, LS) for each of the seven years of our study period (2009, 2010, …, 2015). The estimated ($\theta_t^1, \theta_t^2, \theta_t^3, \theta_t^4$ and θ_t^5) coefficients assess to what extent the country management quality practices (MQ_c) can account for country differences in the impulse responses.

We introduce the interaction between industry-specific shocks and country-specific management quality to test whether good managerial practices have a differential impact depending on the intensity of the shock. If so, they would be overall significant and stronger for industries more deeply affected by the 2008 crisis. This allows to sharpen our identification of the impact of management quality on sectoral outcomes via a Rajan and Zingales (1998) differences-in-differences approach.[7] We measure industry-specific shocks by the fall in output in US industries and make two assumptions: (i) industries have inherent features that expose them differently to the crisis, which do not vary significantly across countries; and (ii) managerial quality is more relevant for industry responses to the crisis in more exposed

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[5] Note that the system of 35 (=5*7) stacked regressions is structured as seven yearly blocks of five equations: Eq_VA(t), Eq_L(t); Eq_W(t), Eq_LP(t), Eq_WL(t), with identical left hand side variables $[\alpha_t SH_i + \theta_t MQ_c + \beta_t (SH_i * MQ_c)]$. We can thus take advantage of this structure to estimate these five blocks separately by simple least squares, with no need for heteroscedasticity correction of standard errors.

[6] Country or industry fixed effects are not introduced in our main specification in order to be able to estimate the α_t and θ_t parameters. However, we have introduced country and industry fixed effects in a robustness analysis and find that the estimates of the β_t coefficients (allowing to test whether the MQ impact is growing with the size of the shock) are basically unchanged. These results are available upon request from the authors.

[7] In diff-in-diff language, management quality is the treatment, highly exposed industries are the treated variables and least exposed industries are the control group.

industries. We therefore use variation across industries in their exposure to the GR shock and variation across countries in their level of management quality to assess the impact of management quality on industry outcomes.

The $(\beta_t^1, \beta_t^2, \beta_t^3, \beta_t^4 \text{ and } \beta_t^5)$ coefficients allow us to test these hypotheses. In other words, the β coefficients estimate how much the impulse response to the 2008 crisis depends on the management practices and how much this dependence varies with the size of the shock.

3. Data and descriptive statistics

We use data from the OECD STructural ANalysis (STAN) database to measure the 2008 shock as well as the subsequent economic adjustment, and data from Bloom, Genakos, Sadun & Van Reenen (2012) to build our indicator of Management Quality. Merging these sources, we were able to assemble a cross country-industry panel balanced over the period 2007-2015 for nine countries: France, Germany, Ireland, Italy, Japan, Poland, Spain, United-Kingdom and USA and eighteen industries listed in the following footnote.[8] Note that we have not included Sweden in our main study sample, since the Swedish data were available only until 2013. A balanced panel is preferable to implement the local projection method; otherwise, changes in

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[8] The market industries are (ISIC Rev. 4 code between parenthesis): 'Food products, beverages and tobacco' (10-12), 'Textiles, wearing apparel, leather and related products' (13-15), 'Wood and paper products, and printing' (16-18), 'Chemical and pharmaceutical products' (20-21), 'Rubber and plastics products, and other non-metallic mineral products' (22-23), 'Basic metals and fabricated metal products, except machinery and equipment' (24-25), 'Electrical, electronic and optical equipment' (26-27), 'Machinery and equipment n.e.c.' (28), 'Transport equipment' (29-30), 'Furniture; other manufacturing; repair and installation of machinery and equipment' (31-33), 'Electricity, gas and water supply; sewerage, waste management and remediation activities' (35-39), 'Construction' (41-43), 'Wholesale and retail trade, repair of motor vehicles and motorcycles' (45-47), 'Transportation and storage' (49-53), 'Accommodation and food service activities' (55-56), 'Publishing, audio-visual and broadcasting activities' (58-60), 'IT and other information services' (62-63), 'Professional, scientific and technical activities' (69-82).

the estimated parameters over-time could be explained by the changes in the country-industry composition of the sample. However, our estimation results are robust to the inclusion of Sweden if we restrict our country-industry panel to a shorter balanced 2007-2013 sample.[9]

3.1. Measure of the industry specific economic shock

The autumn 2008 banking crisis in the USA spread out instantly to both the other industries in the USA, but also in the other countries. A key point of our identification strategy is to simply choose the industry production loss between 2007 and 2009 in the USA to proxy for the industry-specific economic shocks in the other countries of our sample. As shown in the Chart 1, the 2007-2009 production loss between the USA and our estimation sample average for the other countries is relatively small, whereas the industry-specific 2007-2009 production loss differs much within countries. This clearly supports our choice of using the 2007-2009 production loss in the USA industries as a reasonable proxy for the industry-specific production losses suffered in the other countries.

Chart 1: Production loss in 2008
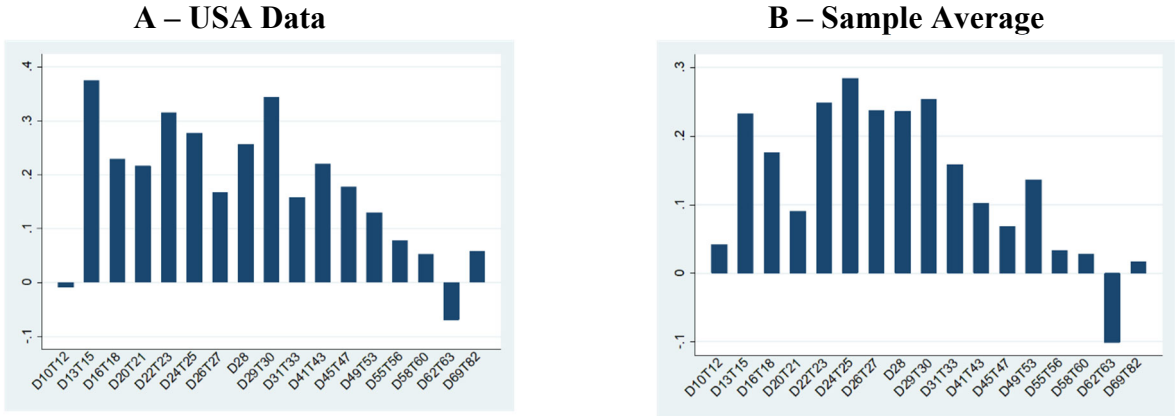
Source: OECD STAN Database

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[9] These results are available upon request from the authors.

However, adopting the 2007-2009 industry production losses in the USA as convenient proxies for the industry-specific economic shocks in the other countries has a drawback: the risk of simultaneity biases arising from correlations between them and the dependent variables (VA, L, W, LP, LS) in our system of equations. We have thus favoured as our main estimates the ones we obtain when excluding the USA from our study sample. We have checked, nonetheless, that our results remain basically unchanged, even if we include the USA in our study sample.[10]

One major reason can largely explain the robustness of our results. The linear correlation coefficients between the 2007-2009 industry production loss in the USA and in the other countries are very high, above 0.70 (with the exception of Ireland and the United Kingdom where three industries are not covered), which reflects that industry fixed effects account for 48% of the variance of country-industry 2007-2009 production losses, whereas country fixed effects account for 14% only. In fact, we could have chosen as two alternative estimates the ones recorded in Appendix B, based on relying on observed or predicted domestic industry shocks instead of the USA industry shocks. We have preferred to proxy the 2008 crisis country industry economic shocks on the USA industry shocks mostly by convenience and simplicity, the quality of the USA data, and the expectation that the estimated coefficient impacts should be more precise.

3.2. *Adjustment during the Great Recession*

Chart 2 illustrates the rebound of growth after the 2008 crisis for our variables of interest (VA, L, W, LP and LS) and the six years 2009 to 2015 as measured in terms of the differences between the sample averages of their log-values in 2007 and in the current years.

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[10] These results are available upon request from the authors.

Chart 2: Sample average cumulated change for value-added, employment, labor productivity, wage per employee and labor share for the study period 2009-2015
Cumulated change = difference between the current and the 2007 log-values
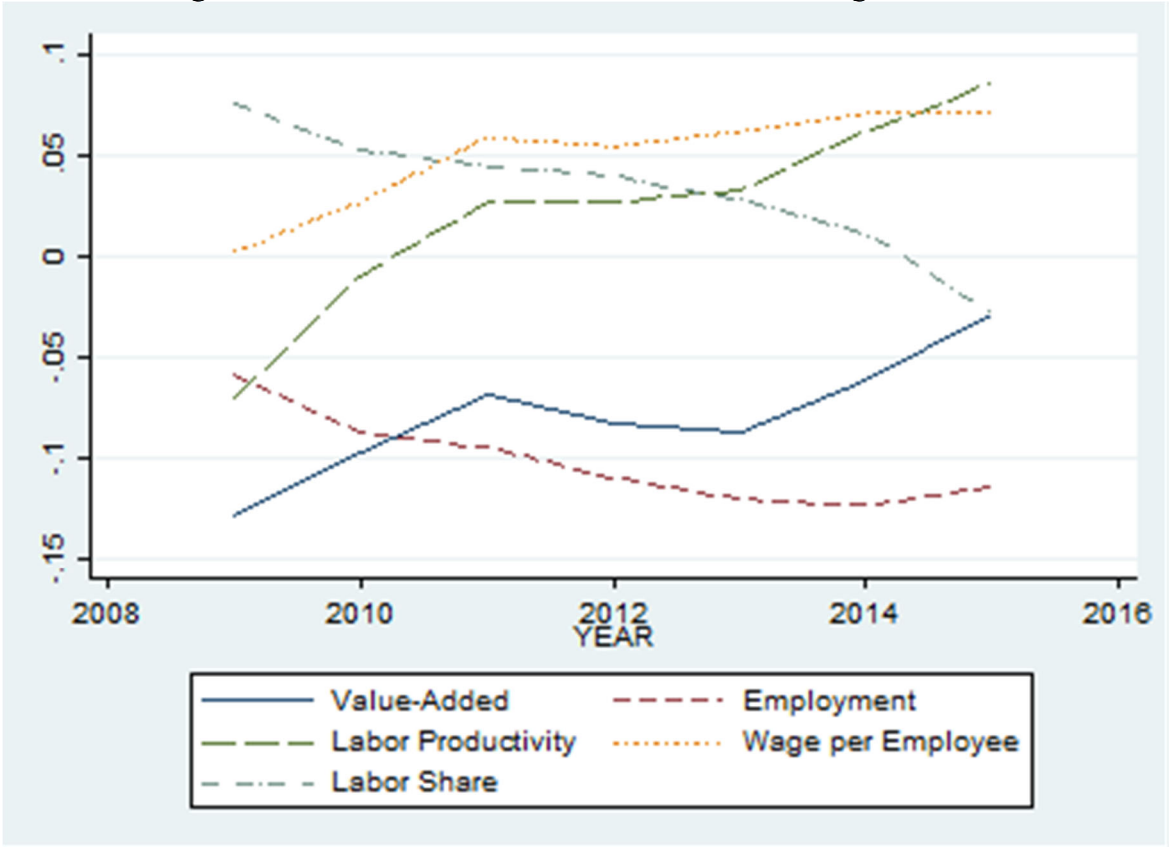
Source: OECD STAN Database

We see that the value-added loss in 2009 is very large, of 12.8%, but that it decreases thereafter to a loss of only 3% in 2015. On the contrary, the loss is more gradual for employment, reaching a maximum of negative cumulated growth level of 12.3% in 2014, with only a small recovery to 11.4% in 2015. Hence, labor productivity is down by 7% in 2009, but recovers thereafter, bypassing its 2007 level in 2011 to reach a 8.5% positive cumulated growth level in 2015. Part of the rise in labor productivity is likely to originate in workers and/or jobs selection. Average wage per employee, maybe for the same reason, experiences a positive cumulated growth, from an initial 0.2% in 2009 to 7.1% in 2015. Last, interestingly, the labor share cumulated growth evolution is very different from that of wages per employee. The labor share is 7.6% higher in 2009 than in 2007 because of the more gradual adjustment of

employment relative to value-added, but as value-added recovers and employment continues to decline, labor share finally shows a 2.8% loss in 2015 relative to 2007.[11]

3.3. *Management quality*

Management quality (MQ) is particularly hard to measure. It requires to define 'good' and 'bad' practices, then to assess the diffusion of these practices among firms. Reliable MQ indicators were not available until recently, largely thanks to the business surveys initiated and widely developed by Nicholas Bloom and John Van Reenen. Our empirical investigation here is largely based on their MQ measures, see in particular Bloom & Van Reenen (2007), Bloom, Sadun & Van Reenen (2012), and Bloom, Lemos, Sadun, Scur & Van Reenen (2014).

As management practices may be contingent upon firms' specific environment, the Bloom and Van Reenen business surveys are focused on some practices that can be deemed 'good' or 'bad' irrespective of their environment.[12] Their survey includes eighteen questions asked to medium- to large-sized manufacturing firms (with 50 to 10.000 workers).[13] These questions cover four areas: *Monitoring*: How well do organizations monitor developments inside the firm, and use this information for continuous improvement? *Targets*: Do organizations set the right targets, track the right outcomes, and take appropriate action if the

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[11] Note that the rebounds of growth after the 2008 crisis for our variables of interest (VA, L, W, LP and LS) are captured by year fixed effects in the next Section 4 presenting estimation results. This is important to keep in mind for their correct interpretation. For instance, positive impacts of management quality MQ on employment growth over the years 2007-2015 signal higher increases in employment growth in higher quality countries relative to lower quality countries, but do not indicate absolute positive impacts on employment growth.

[12] To assess the soundness of such requirement Bloom & Van Reenen (2007) show that their MQ indicators are significantly associated with higher firm productivity, sales growth rates, profitability, Tobin's Q, and survival rates.

[13] The full set of questions is provided in Bloom & Van Reenen (2007). The data are freely available on the World Management Survey website https://worldmanagementsurvey.org/.

two are inconsistent? *Incentives*: Are organizations promoting and rewarding employees based on performance, prioritizing careful hiring, and trying to keep their best employees? *Operations*: Introduction and utilisation of lean production methods.

All these questions are scored on a scale from 1 to 5, increasing in the quality of practices. The composite indicator measured as the unweighted average of these scores is our underlying Management Quality measure (MQ_f) at the firm level. It is computed for all the firms (f) which have been surveyed during the pre-crisis period for the years 2003-2007 in our ten countries.[14] We then simply obtain our basic Management Quality variable at the country level (MQ_c) by taking the median of the firm level measures (MQ_f) for the firms of each of our ten countries.

Three remarks are important. First, while the purpose of our paper is to investigate the impacts of management on the adjustment to the 2008 crisis during the Great Recession, it is likely that management practices have been simultaneously affected by the Great Recession. To avoid this potential source of endogeneity, we have chosen, as already mentioned, to only rely on the data from the business surveys conducted before the 2008 economic crisis to construct the country level management quality indicators (MQ_c).

Second, our main study sample is a balanced country-industry panel, covering both manufacturing and non-manufacturing industries, while our management quality indicators (MQ_c) at country level are based on the management quality measures (MQ_f) at firm level, where all the firms surveyed Bond & Van Reenen (2012) are medium- to large-sized manufacturing firms. When restricting our study main sample to manufacturing industries only, we have found that the estimates for the direct yearly impacts of country management quality

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[14] Note that Spain was not included in Bloom *et al*. (2012) survey, and that we used Bloom *et al*. (2014) data for this country. When we exclude Spain from our main study sample, we find that our estimation results are basically unchanged. These results are available upon request from the authors.

are robust, but that the ones for their interaction with the industry specific shocks turn out to be not statistically significant (these results are discussed in section 4.4).

Third, based on our management quality composite indicator at firm level (MQ_f) at the firm level, we have also considered, in parallel to our basic indicator at country level (MQ_c), one at country-industry firm level (MQ_{ci}), and another one at industry level (MQ_i), all three measures being based on the same underlying sample of firms. We have found that the estimates of impacts for the country-industry level and industry level management quality measures are both very close to our main estimates of impacts for the country level measures. However, the corresponding estimates for their interaction with the industry specific shocks lose significance relative to estimates relying on the country level measure.[15]

Chart 3 shows the distribution of the firms' values of our composite management quality indicator at firm level (MQ_f) during the pre-crisis period (2003-2008). It documents also in the legend their median values for each of our ten countries, that is our management quality measure at country level (MQ_c), as well as the number of individual firm observations (NbF) underlying the country (MQ_f) distributions and their median values (MQ_c).

The average country management quality indicator (MQ_c) and (NbF) respectively amount to 3.06 (on a scale of 1 to 5, 5 for the best practices) and 425 observations. The countries with the highest (MQ_c) are Japan (3.28) and the USA (3.29), and the ones with the smallest (MQ_c) are Poland (2.90), Ireland (2.83) and Spain (2.75). The countries with the highest (NbF) are the United Kingdom (1239) and France (656), and the ones with the smallest (NbF) Japan

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[15] These results are available upon request from the authors. An empirical reason why we estimate more precisely the impacts of interaction variable relying on the country level management quality indicator is its reduced collinearity with the industry specific shocks. Another reason is probably a smaller variance of random measurement errors. As already noted in previous footnote 11: "Variance analysis shows that industry fixed effects account for 48% of the variance of country-industry 2007-2009 production losses, whereas country fixed effects account for 14% only".

(155) and Ireland (89). As can be seen on the Chart Ireland and Japan are also the two countries with the most spread out distributions.

Chart 3: Distribution of management quality at firm level by country during the pre-crisis period (2003-2008).
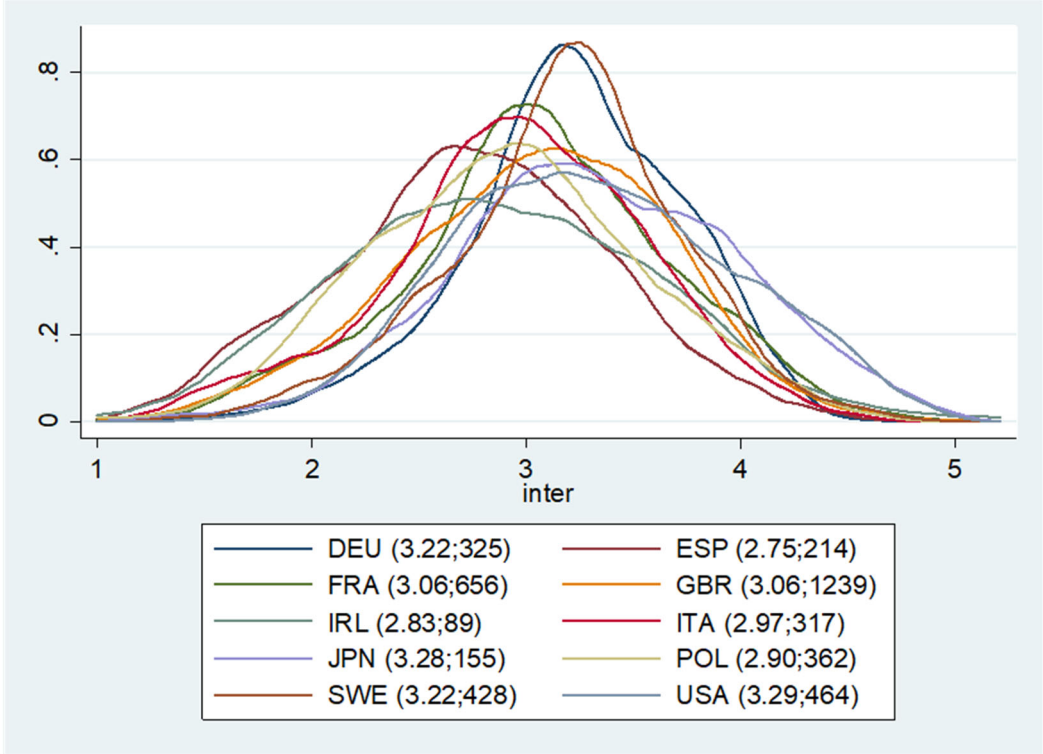
Source: Authors calculations using Bloom *et al*. (2012) data.

4. Estimation results

Our model, as written in Sub-section 2.2, is a system of 35 (=5 variables*7 years) stacked regressions defined as separate linear projections, each of which can be simply expressed as:

$$\ln(var_{cit}) - \ln(var_{ci07}) = \alpha_t^{var} SH_i + \theta_t^{var} MQ_c + \beta_t^{var}(SH_i * MQ_c) + \phi_t^{var} + \varepsilon_{cit}^{var}$$

where var stands for value-added (VA), labor (L), wage (W), labor productivity (LP) and labor share (LS), and where the year (t) denotes the seven years of our study period (2009, 2010, …, 2015). The estimation results for the complete set of regressions are reported in Appendix A Table A.

In the three Sub-sections 4.1, 4.2 and 4.3, we respectively present and comment our main estimates of the yearly direct and joint impacts (α_t^{var}, θ_t^{var} and β_t^{var}). Note that the shock and management quality variables (SH_i) and (MQ_c) variables are centered, implying that (α_t^{var}, θ_t^{var} and β_t^{var}) are estimated at their mean values. The Sub-section 4.4 presents the sensitivity analysis for these three sets of estimated parameters.

4.1.   Direct economic impacts of the Great Recession

Chart 4 shows the yearly evolution of the estimated direct impacts of the Great Recession on our five variables of interest, which means that a 2008 crisis production loss of 1% in an USA industry results on average in year (t) in an overall change from 2007 to year (t) of α_t^{var}% for our five variables in the same industry of the non-USA countries.

Chart 4: Evolution over the period 2009-2015 of the direct impacts of the 2008 crisis USA industry production shocks (α_t)
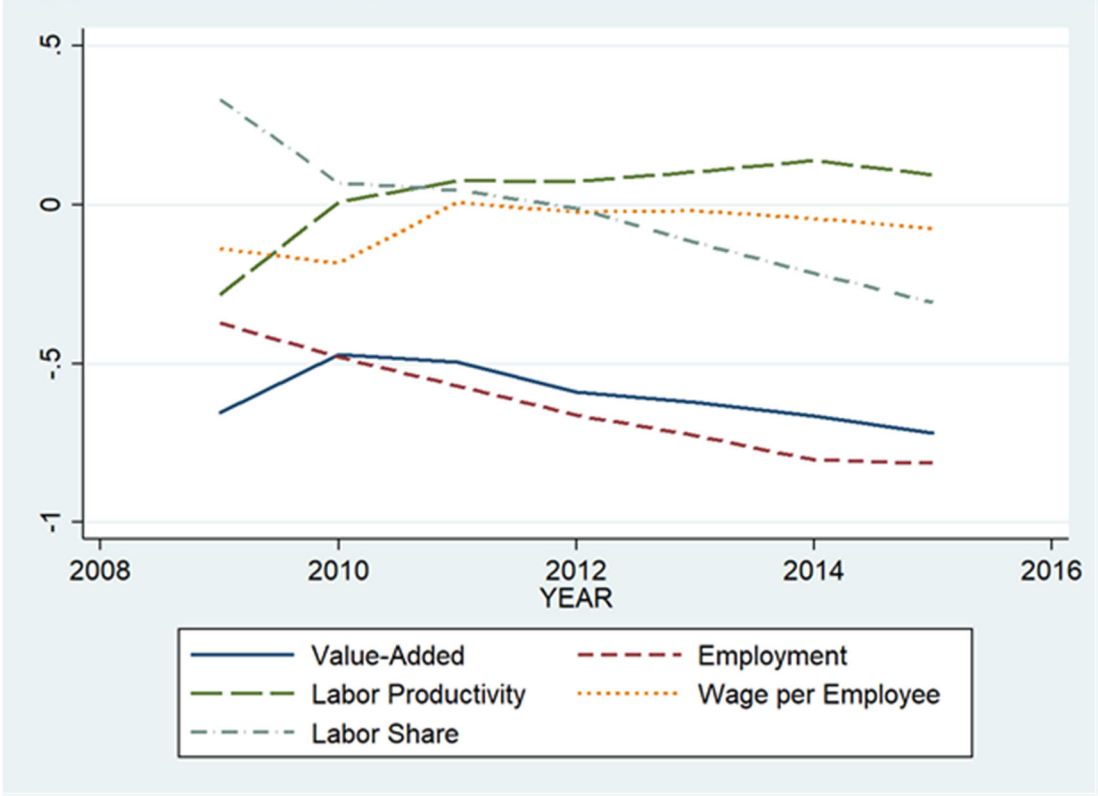
The estimated value of the direct impact is negative and strongly persistent on value-added and employment. For labor productivity, it appears negative in the first year 2009, and nil afterwards, which reflects an employment adjustment one year slower that the value-added adjustment. The estimated impact on the real wage per employee is negative in 2009 and 2010, and not significantly different from zero after. The estimated impact on the labor share is positive in 2009, and declines continuously afterwards to become significantly negative after 2013.

## 4.2. Direct impacts of management quality on the adjustment to the Great Recession

Chart 5 consists of five graphs of the yearly evolution of the estimated direct impacts of country management quality, with their confidence intervals, for each of our five variables of interest, showing that an increase of the management quality indicator (MQ$_c$) equal to (x%) in country (c) in year (t) results, on average, in an overall change of ($\theta_t^{par} * x\%$), from 2007 to year (t) in each industry of country c, for the considered variable of interest. Management quality has a direct positive impact on value-added and employment, this impact being nevertheless non-significantly different from zero for value-added only in 2009 and 2015. Consequently, there is almost no significant impact on productivity, except a negative one in 2009. The direct impact of management quality is negative on the real wage, nevertheless non-significantly in 2010 and 2015; and the one on the labor share is nil in the first years and becomes significantly positive from 2012 onwards.

One interpretation of these results is that the direct impact of management quality moves the trade-off between employment and the real wage. Higher management quality preserves employment at the expense of real wages, which are declining, with positive impacts on labor shares in the medium run. Positive impacts on employment are matched with positive impacts
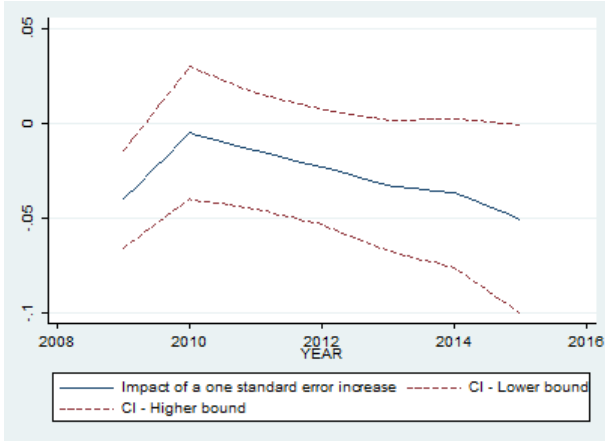
on output levels. Thus productive performance does not appear to be directly impacted by management quality.

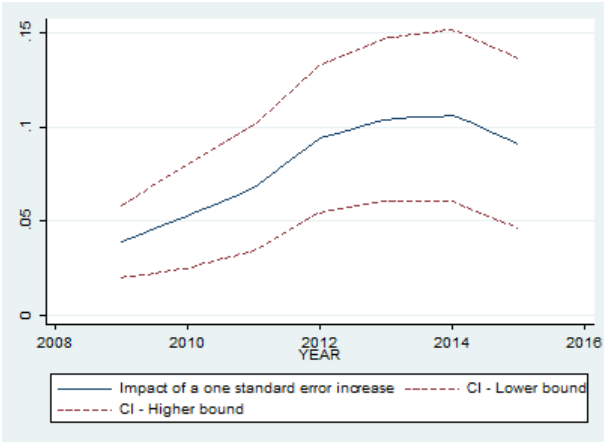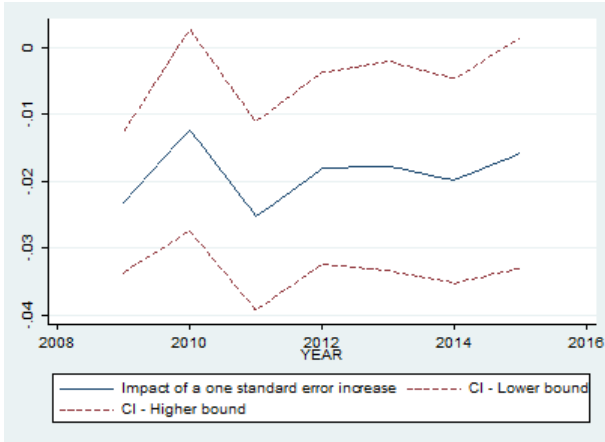**Chart 5: Evolution over the period 2009-2015 of the direct impacts of country management quality (θ_t)**

A – Valued-added
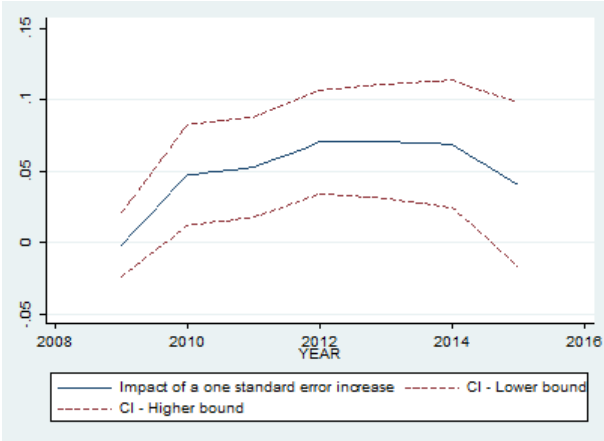
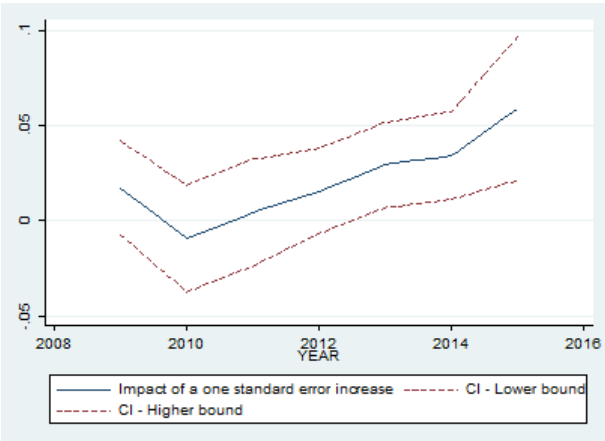**C – Labor productivity**

B – Employment

D – Wage per worker

E – Labor share

Overall, the detrimental direct impacts of the Great Recession on employment have been attenuated in countries with good managerial practices, which have leveraged wage moderation to cushion direct effects of shocks on employment.

4.3. Joint impacts of management quality and economic shocks on the adjustment to the Great Recession

As already mentioned, we measure country management quality by their values before the 2008 crisis and the economic shocks by size of the shock per industry in the USA in 2008. An increase of the management quality indicator (MQ_c) equal to ($x\%$) in country (c) in year (t) for a given shock of SH_i in an USA industry i corresponds on average to an overall change of $\left[\theta_t^{var} + (\beta_t^{var} * SH_i)\right] * x\%$ from 2007 to year (t) for our five variables in the same industry of the non-USA countries.

The parameters β_t of joint impacts of management quality and economic shocks are significantly positive for value-added and employment, but not significantly different from zero for labor productivity, real wage per worker and labor share. The implication is that the impacts of managerial practices are higher in industries more exposed to the shocks of the Great Recession than in the industries less exposed.

Chart 6 presents these estimation results in terms of two box plots showing what are the impacts of one standard error increase of country management quality on value-added and employment changes in the years (2009, 2010, …, 2015) compared to 2007 for industries where the specific shocks are ranging from no shock to most important shocks.

These results confirm that the detrimental medium to long-term impacts of the Great Recession on industry-specific value-added and employment levels depend on the size of the shocks, but that at the same time the positive indirect impacts of management quality on these two variables are also related to the size of the shocks. The bigger are the shocks, the larger are

both the direct detrimental impacts of the shocks and the positive indirect impacts of management quality.

These results could carry implications for the way countries are able to weather the economic effects of the Covid-19 crisis, even if they crucially differ in many ways from the impacts of the Great Recession. In particular, the Covid-19 crisis, combines an initial supply shock with a later demand shock and it involves specific policy responses, centered on attempts to support employment levels and firms' solvency (e.g. via job retention schemes and state-guaranteed loans). It remains that management quality could significantly alleviate the destructive impacts of the Covid-19 crisis on employment and production.

Chart 6: Joint impact of management quality and economic shocks $(\theta_t + \beta_t . shock_i^{US})$

A – Valued-added   **B – Employment**
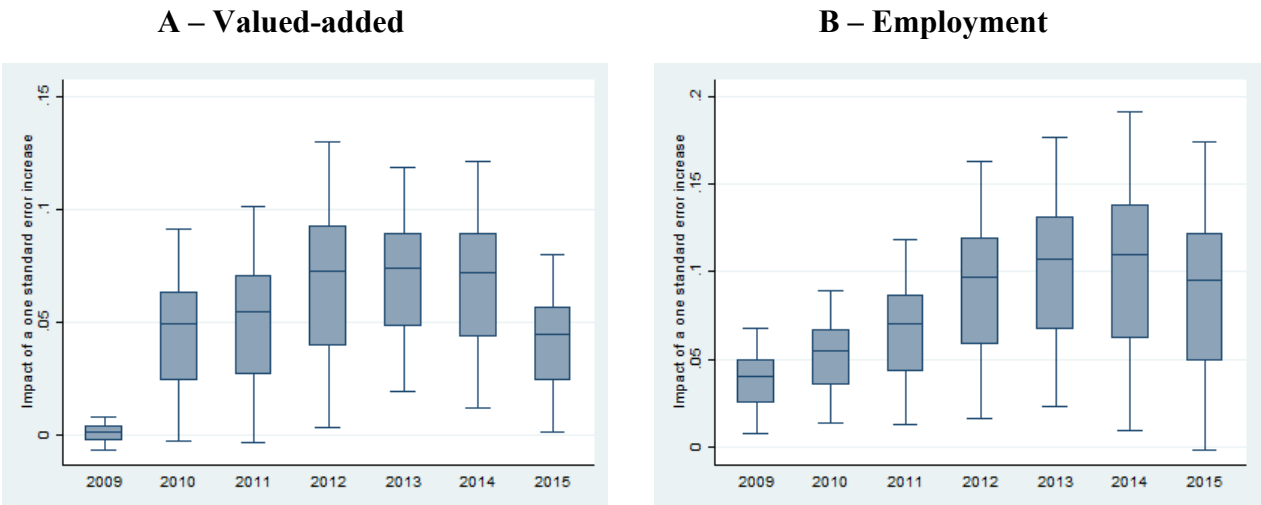
Lecture note to box plots A and B: From our estimated results, the impact of one standard error increase of the management quality on the value-added change in 2015 compared to 2007 would be 0.1% in industries where the shock was nil, 2.6% for the first quartile of shock, +4.3% for the median shock, +5.7% for the third quartile of shock and +8.2% for the most important shock.
From our estimated results, the impact of one standard error increase of the management quality on the employment change in 2015 compared to 2007 would be -0.1% in industries where the shock was nil, +5.0% for the first quartile of shock, +9.3% for the median shock, +12.3% for the third quartile of shock and +17.9% for the most important shock.

4.4. Sensitivity analysis

In this Sub-section, we investigate the sensitivity of our estimation results. We first check the robustness of the results to the estimation sample, then to the set of fixed effects and to the estimation method of standard errors.[16] Finally, we dig deeper on the issue of potential endogeneity bias by providing Instrumental Variable (IV) estimates.

Several of our estimation assumptions have an impact on our estimation sample. As we need a balanced panel in order to compare the yearly results, Sweden is excluded from our main estimation sample (Swedish data are available only until 2013). As we measure the economic shock at the industry level with the corresponding 2008 USA production losses, the USA is also excluded from the main estimation sample to avoid endogeneity issues. However, our analysis shows that the estimation results are robust to the inclusion of both Sweden and the USA in the estimation sample.

At the same time, the main estimation sample includes Spain although for this country management quality data were not available before the 2008 crisis. The use of post 2008 management quality data for this country may lead to an endogeneity bias if management quality was affected by the crisis. Nonetheless, our estimation results are basically unchanged when we exclude Spain from our study sample.[17]

Finally, our management quality indicator is based on Bloom et al. (2012)'s manufacturing firm survey, but our estimation sample includes also non-manufacturing sectors. When restricting our study sample to manufacturing industries only, we find that the size and significance of the estimates for the direct yearly impacts of country management quality (θ_t) do not change, but the interaction with the industry specific shocks (β_t) loses significance. This loss of significance for the joint effect may be related to the weak variability of the industry-

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[16] The corresponding results are available upon request from the authors.
[17] Our estimation results are also robust to the exclusion of any country or industry from the estimation sample.

specific shocks in the manufacturing sector. Indeed, Chart 1 shows that an important part of the industry shock variability comes from the difference between manufacturing and non-manufacturing industries.

Country or industry fixed effects are not introduced in our main specification in order to be able to estimate all the direct effect parameters (α_t and θ_t). Indeed, our management quality indicator is measured at the country level and the industry shock variable is measured at the industry level. However, when we introduce country and industry fixed effects (dropping the variables having the same dimension) we find that the size and significance of the estimates of the joint effect coefficients (β_t) - allowing to test whether the MQ impact is growing with the size of the shock - are basically unchanged.

Our main estimation results are based on heteroscedasticity-consistent standard errors using the Huber-White approach (see Appendix A Table A). In the sensitivity analysis, we investigate the robustness of our results to various other measures of the standard errors. First, the Huber-White standard errors are consistent under some assumptions, but our sample is relatively small, so we check and confirm that the statistical significance of our results is unchanged if we use standard errors with no correction at all. Then we use the Newey-West standard errors to deal with heteroscedasticity and autocorrelation of the residuals and we use country-clustered standard errors, as our measure of management quality is country-specific. In both cases, the statistical significance of our results is unchanged. Finally, we also use a non-parametric bootstrap approach to measure the standard errors. In this case as well our results are confirmed.

In order to avoid potential endogeneity bias, we use management quality data prior to the 2008 crisis and we exclude the USA from our main estimation sample, reflecting our choice to measure industry shocks in all countries by those in the USA. This approach deals with reverse causality. Potential omission bias for management quality is dealt with in different

ways. First, as already mentioned, the estimation of the joint effect allows to test whether the management quality impact depends of the industry exposure to the shock, as in Rajan and Zingales' (1997) difference-in-difference approach. Second, we introduce several control variables possibly related to managerial quality: the OECD Employment Protection Legislation indicator (which measures the flexibility of hiring and firing procedures), various OECD Product Market Regulation indicators (which measure the intensity of competitive pressures) and the average education level in the country. We find no significant impact of these variables on the adjustment to the 2008 crisis (so we do not develop further these results in our paper) and, more importantly, the estimated impact of managerial quality is robust to their inclusion as control variables.

Finally, we use an IV approach to deal with potential biases coming from both omitted variables and measurement error. Indeed, the 2008 USA production loss is a proxy of the shock experienced in all country*industry and our management quality indicator is at best an imperfect measure of management quality after the crisis. Because of this, our estimates could under-estimate the size of the true parameters.

To account for country*industry specific shocks, while at the same time avoiding endogeneity, we instrument the domestic 2008 industry production loss with the USA production loss in the same industry. Indeed, as shown in section 3.1, the USA industry production loss is strongly related to the domestic industry production loss. The corresponding estimation results are provided in Appendix B Table B. The statistical significance of the estimates is unchanged and the direct as well as joint effect of the industry shock (α_t and θ_t) are higher, though the increase is relatively small.

5. Country simulations

Using our estimation results, we have run country simulations to assess the potentially positive impacts on employment of a higher quality of management during the Great Recession and the subsequent recovery. We focus on employment as a major policy variable of interest. The estimated impacts on employment of management quality, economic shocks and their interactions, are statistically very significant and robust. In these simulations we benchmark the production loss between 2007 and 2009 for the USA as a whole economy (rather than USA at industry-level) to guesstimate directly the aggregate employment country effects. We also benchmark management quality on the USA, which is the highest of the eight countries of our main study sample, choosing its level in 2007, last year prior the 2008 crisis. The cross-country differences in the simulated employment gains of moving management quality to USA levels in 2008 are thus driven by the initial country-specific gaps in management quality relative to the USA. Chart 7 presents these simulation results for the year 2015, six years after the start of the Great Recession.

Chart 7: Simulated impact on country employment in 2015 of moving pre-crisis management quality to USA level assuming USA level economic shocks
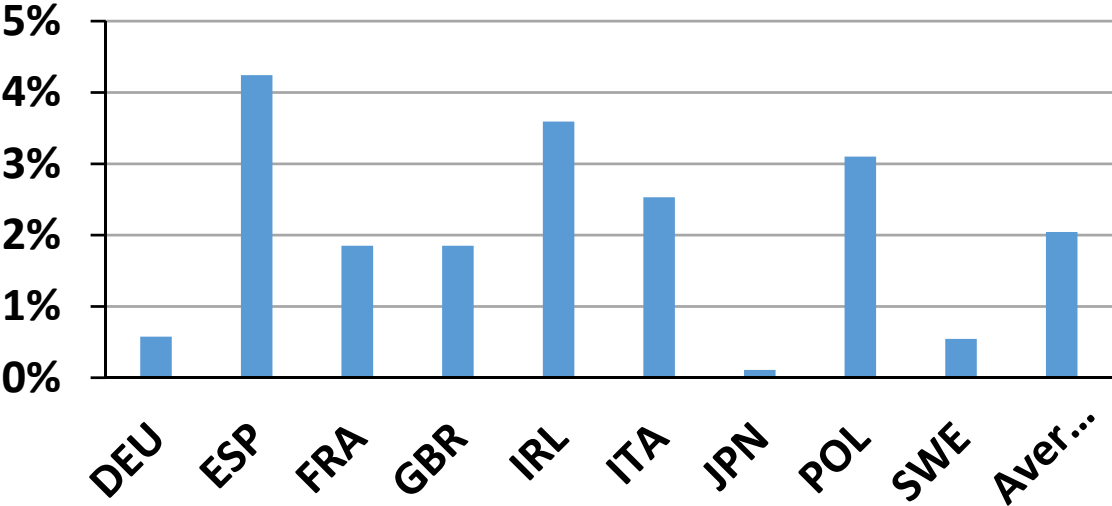
Note: The bars show the percentage gain in employment in 2015 relative to actual employment levels experienced by each country if they had faced the same aggregate production loss as in the USA and had moved their median management quality to USA levels in 2007.

According to our estimates, raising management quality to USA levels in 2007 would have improved the aggregate level of employment by 4.2% in Spain in 2015. Unsurprisingly, almost no improvement would have been observed in Japan, where quality of management was very close to USA levels in 2007. The other countries are in intermediate situations: with large improvements by more than 3% in Ireland and Poland; average improvements by about 2% in France and Great Britain; and small improvements by less than 1% in Germany and Sweden.

In Appendix C Chart C, for the sake of completeness, we give a chart similar to Chart 7 showing the simulated impact on employment in 2015 of moving pre-crisis management quality to USA level, but assuming the average sample country production shock rather than the production USA aggregate production shock.

6. Conclusions

There is an extensive economic literature on the effects of managerial talent on firm-level outcomes, but research has been scant on how these translate into macroeconomic aggregates. Moreover, research has focused mostly on medium to long-run effects, with little attention to how managerial talent shapes economic resilience over the cycle and during economic crises. Yet, managerial talent is related to important institutional features such as the competitive market environment, labor market flexibility, education systems and cultural and historical heritage, which have been shown to contribute to economic resilience.

This paper takes a first step towards looking at the link between prevailing managerial practices in a country and its ability to weather serious economic shocks, possibly lessening persistent effects on labor utilization and, therefore, productive potential. Taking a dynamic estimation approach, we focus on the macroeconomic impact of managerial practices on employment and production in a sample of OECD countries over the Great Recession,

measuring resilience by the ability of countries to limit industry-level employment damages and production losses. We show that countries that, on average, enjoyed a higher quality of management have been able to better weather the crisis and its aftermath regarding employment and production than other countries. Interestingly, there is also evidence that this outcome was reached thanks to the ability to moderate real wage growth and has also resulted in better overall outcomes in terms of labor shares.

Our results, which are robust to several sensitivity checks, could have implications that go beyond the Great Recession and inform analysts and policy-makers on the likely comparative resilience of OECD economies to the current Covid-19 crisis and the importance of raising the level of managerial abilities in view of possible future shocks. Clearly, the causes, intensity and features of the Great Recession are crucially different from those of the Covid-19 crisis. Moreover, the policies implemented to protect jobs and firms during the height of the Covid-19 pandemic and considered in the context of the recovery plans differ also substantially from those implemented in the aftermath of the Great Recession. For these reasons, the effect of management quality on macroeconomic outcomes could be quantitatively different in the context of the Covid-19 pandemics and subsequent recovery. Yet, we would expect this effect to be qualitatively similar and act through comparable channels. Extrapolating from our simulation results (Section 5), we can very tentatively presume that the long-term impact of Covid-19 on employment could depend not only on the incidence of the pandemic and of the related restrictions (the size of the shock) but also on the quality of management in each country in the wake of the crisis. In this respect, countries that suffered from both the hardest pandemic shock (e.g. in terms of GDP loss induced by lockdown measures) and the lowest median quality of management could experience the strongest long-term negative employment impact from the Covid-19 crisis. Conversely, countries where the pandemic shock was more benign and

management quality was highest could enjoy a double dividend from these factors in terms of lesser long-term consequences of the crisis on employment.

While we consider our results informative and potentially insightful, we are also aware of their limitations and that we have just scraped the surface of a promising research agenda. Specifically, our approach to identification goes some way towards establishing potentially causal links, but given the aggregate level of the analysis and the inherent limits in the data (as well as our treatment of them) more research will be needed to confirm our findings. Also, while our sample covers countries with large differences in managerial abilities and macroeconomic outcomes during the Great Recession, extending the country coverage to non-OECD countries would be useful (once the data are available) to enhance our identification strategy. Moreover, covering a longer period that includes shocks of a different nature, e.g. both demand and supply driven, could also increase the external validity of our results. In the same spirit, it would be interesting to check whether managerial abilities also affect macroeconomic outcomes during expansionary periods. Finally, in our paper we have unveiled a link between managerial practices and macroeconomic outcomes, but it would be desirable to go a step beyond and consider how this link is shaped by prevailing institutional settings (e.g. in labor and product markets). We leave these interesting issues for future research.

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Appendix A: Main Estimates

Table A: Main estimates
Note: the explanatory variables are centered

Dependent variable	(1) Value-added	(2) Employment	(3) Wage per worker	(4) Labor Productivity	(5) Labor Share
Panel A: Impact of the industry specific USA shock (α_t) in:					
2009	-0.629***	-0.355***	-0.130***	-0.274***	0.307***
	[0.0666]	[0.0534]	[0.0353]	[0.0781]	[0.0676]
2010	-0.461***	-0.457***	-0.177***	-0.00381	0.0632
	[0.0743]	[0.0777]	[0.0634]	[0.0880]	[0.0781]
2011	-0.489***	-0.544***	0.00613	0.0558	0.0443
	[0.0952]	[0.0975]	[0.0534]	[0.109]	[0.0835]
2012	-0.585***	-0.636***	-0.0236	0.0510	-0.0116
	[0.111]	[0.108]	[0.0506]	[0.118]	[0.0824]
2013	-0.618***	-0.698***	-0.0182	0.0798	-0.112
	[0.129]	[0.117]	[0.0535]	[0.128]	[0.0979]
2014	-0.661***	-0.772***	-0.0418	0.111	-0.205**
	[0.146]	[0.133]	[0.0542]	[0.143]	[0.0988]
2015	-0.713***	-0.783***	-0.0758	0.0703	-0.298**
	[0.166]	[0.136]	[0.0619]	[0.156]	[0.116]
Panel B: Country management quality impact (θ_t) in:					
2009	-0.00889	0.187***	-0.114***	-0.196***	0.0856
	[0.0555]	[0.0479]	[0.0259]	[0.0641]	[0.0607]
2010	0.230***	0.255***	-0.0639*	-0.0248	-0.0423
	[0.0887]	[0.0695]	[0.0365]	[0.0891]	[0.0692]
2011	0.256***	0.325***	-0.123***	-0.0691	0.0244
	[0.0875]	[0.0831]	[0.0349]	[0.0778]	[0.0692]
2012	0.342***	0.453***	-0.0873**	-0.111	0.0817
	[0.0907]	[0.0975]	[0.0357]	[0.0781]	[0.0555]
2013	0.346***	0.504***	-0.0872**	-0.158*	0.148***
	[0.100]	[0.107]	[0.0390]	[0.0880]	[0.0560]
2014	0.336***	0.513***	-0.0980**	-0.177*	0.173***
	[0.112]	[0.114]	[0.0384]	[0.100]	[0.0581]
2015	0.194	0.439***	-0.0784*	-0.245*	0.295***
	[0.144]	[0.113]	[0.0433]	[0.127]	[0.0955]
Panel C: Joint impacts of management quality and economic shocks (β_t) in:					
2009	0.263	1.370***	-0.258	-1.107**	0.0331
	[0.449]	[0.352]	[0.203]	[0.529]	[0.455]
2010	1.337***	1.649***	0.482	-0.312	-0.976*
	[0.487]	[0.554]	[0.421]	[0.650]	[0.546]
2011	1.443**	2.338***	-0.508	-0.895	-0.696
	[0.716]	[0.697]	[0.324]	[0.764]	[0.612]
2012	1.934**	3.004***	-0.562*	-1.071	-0.767
	[0.775]	[0.780]	[0.304]	[0.784]	[0.542]
2013	1.519*	3.090***	-0.250	-1.571*	-0.324
	[0.918]	[0.841]	[0.316]	[0.827]	[0.572]
2014	1.712	3.458***	-0.302	-1.746*	-0.368
	[1.044]	[0.929]	[0.304]	[0.914]	[0.561]
2015	1.519	3.316***	-0.0362	-1.797*	-0.133
	[1.163]	[0.941]	[0.381]	[1.029]	[0.682]
Observations	791	791	791	791	791
R-squared	0.239	0.384	0.167	0.142	0.147

Robust standard errors in brackets; *** $p<0.01$, ** $p<0.05$, * $p<0.10$

Appendix B: Using domestic industry shocks instead of USA industry shocks

Table B shows the estimation results when using domestic industry shocks instead of USA industry shocks. To deal with the endogeneity issue it implies, we use the Instrumental Variable estimator, with the 2008 USA industry production loss as an instrument.

Table B: IV estimates using domestic industry shocks instead of USA industry shock
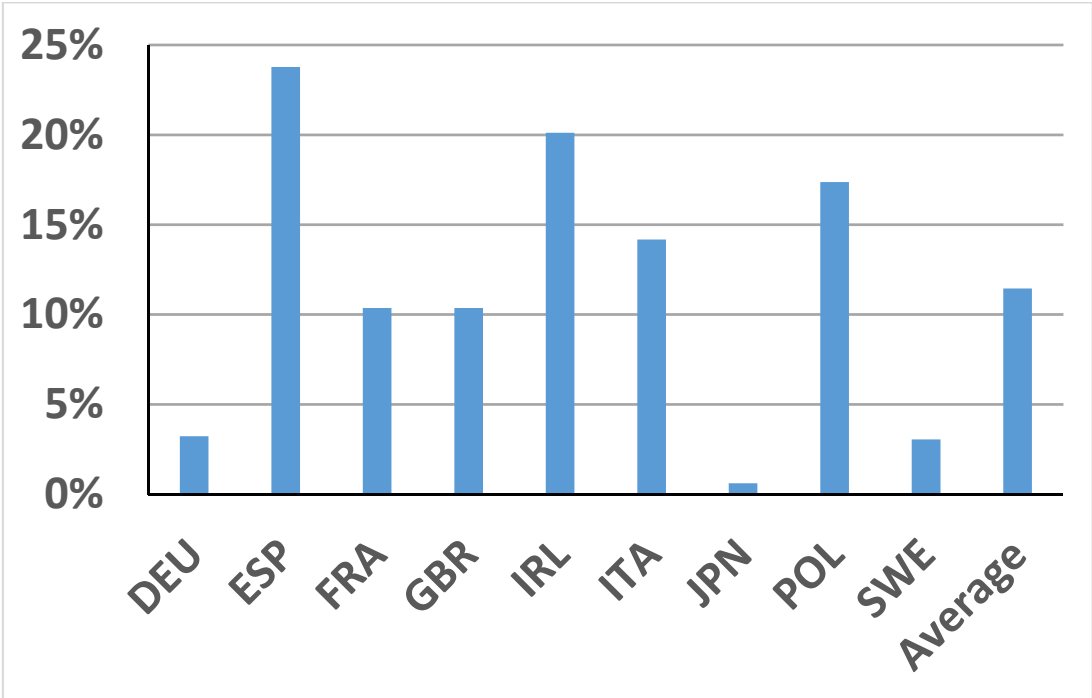
Note: the explanatory variables are centered

Dependent variable	(1) Value-added	(2) Employment	(3) Wage per worker	(4) Labor Productivity	(5) Labor Share
Panel A: Impact of the predicted industry country shock (α_t) in:					
2015	-0.823***	-0.793***	-0.101	-0.0306	-0.397***
	[0.207]	[0.180]	[0.0698]	[0.221]	[0.140]
Panel B: Country management quality impact (θ_t) in:					
2015	0.229	0.516***	-0.0793*	-0.287**	0.292***
	[0.145]	[0.116]	[0.0433]	[0.119]	[0.0910]
Panel C: Joint impacts of management quality and economic shocks (β_t) in:					
2015	1.974	4.308***	-0.0470	-2.334*	-0.173
	[1.511]	[1.222]	[0.494]	[1.337]	[0.886]
Observations	113	113	113	113	113
R-squared	0.147	0.505	0.457	0.194	0.161

Robust standard errors in brackets; *** p<0.01, ** p<0.05, * p<0.10

Appendix C: Alternative policy simulation on employment in 2015

Chart C shows the simulated impact on employment in 2015 of moving pre-crisis management quality to USA level, but assuming the average sample country production shock rather than the production USA aggregate production shock.

Chart C: Simulated impact on country employment in 2015 of moving pre-crisis management quality to USA level assuming USA level economic shocks

Note: The bars show the percentage gain in employment in 2015 relative to actual employment levels experienced by each country if they had faced the same aggregate production loss as in the USA and had moved their median management quality to USA levels in 2007.