Market Regulations, Prices, and Productivity

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A large body of literature investigates the productivity impacts of product and labor market imperfections, and of the anti-competitive regulations establishing and supporting them (see Aghion and Howitt, 2009, for a survey). This paper greatly extends the scope of previous studies that focus on the effect of product market regulation in non-manufacturing industries on the productivity of all industries (see Conway *et al.*, 2006, Barone and Cingano, 2011, Bourlès *et al.*, 2013, and Cette, Lopez and Mairesse, 2013, among others).

To our knowledge, this study is the first attempt to assess the consequences on productivity of anti-competitive regulations in product and labor markets through their effects on production prices and wages (Askenazy, Cette and Maarek, 2013, rely on similar assumptions to analyze the effects of anti-competitive regulations on income

shares).[1] It does so by considering three channels through which regulations can impact multi-factor productivity (MFP): (i) the direct influence of product market regulations on the productivity of the regulated industry, through rent building; (ii) the indirect productivity impact of these regulations on the other industries , through rent sharing between regulated industries producing intermediate inputs and industries using these inputs; and (iii) the influence of labor market regulations on the rent sharing process between firms and workers.

Our approach is theoretically grounded in the model developed by Blanchard and Giavazzi (2003), which "is built on two basic assumptions: monopolistic competition in the goods market, which determines the size of rents; and bargaining in the labor market, which determines the distribution of rents between workers and firm." (pp. 879-880). In other words, firms can take advantage of the market power induced by product market anti-competitive regulations to charge higher production prices which generate rents. Workers can capture through higher wages a share of

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[1] See Cette, Lopez, Mairesse (2014) for more details.

these rents, which varies with their bargaining power, itself largely influenced by labor market regulations. Our empirical framework is an attempt to assess the productivity impact of regulations as mediated by their effects on production prices and wages.

I. Data and Regression Equation

Our analysis is grounded on a country*industry panel data sample of 2,820 observations from 14 OECD countries (Austria, Canada, Czech Republic, Denmark, Finland, France, Germany, Italy, Japan, the Netherlands, Spain, Sweden, the United Kingdom and the United States), from 1987 to 2007, and 18 industries covering the manufacturing and market services industries, with the exception of the real estate industry.

Our analysis basically relies on a regression equation assuming that product market imperfections in an industry generate higher production prices and rents, which have a "direct" impact on *MFP* in the same industry and an "indirect" impact on *MFP* in other industries. When industries are able to charge relatively high prices and benefit from large rents, they have fewer incentives to improve their efficiency and to innovate but also more financial resources to do so. We can thus expect that the direct impact on *MFP* could be either negative or positive. A negative sign may a priori seem more likely for non-manufacturing industries generally sheltered from foreign competition and often protected from national competition by product market regulations. But this may also be true for manufacturing industries when they are protected from foreign competition by high tariff barriers. High prices and rents in industries producing intermediate inputs (named upstream industries) may also be indicative of weaker incentives to improve efficiency and to innovate in industries using these intermediate inputs (named downstream industries), when the rents that downstream industries can generate are partly appropriated by upstream industries that have market power. Therefore, the expected indirect impact on *MFP* is unambiguously negative.

Our regression equation also assumes that labor market imperfections may result in higher wages and lower profits, entailing a negative impact on the industry *MFP*. Employment protection legislation, professional agreements and standards, shortage of qualified workers, etc., contribute to higher wages, implying that rents, which could have been fully appropriated by firm owners and shareholders, are shared with workers. In turn, firms have fewer incentives and financial resources to improve their efficiency and to innovate. We can thus

expect that the wage indicator has a negative impact on *MFP*.

Therefore, our main regression specification is the following:

$$(1) \ mfp_{cit} = \alpha \, D\_p_{ci(t-1)} + \gamma \, I\_p_{ci(t-1)}$$
$$+ \lambda \, J\_w_{ci(t-1)}$$
$$+ \theta \, mfp_{US \, i(t-1)} + \eta_c + \eta_i$$
$$+ \eta_t + \eta_{ci} + \eta_{ct} + \varepsilon_{cit}$$

where mfp_{cit} is the multi-factor productivity, in logarithm, of country c, industry i and year t; D_p_{cit}, I_p_{cit}, J_w_{cit} are respectively the production price indicators of direct and indirect impacts and the wage impact indicator; $\eta_c, \eta_i \, \eta_t, \eta_{ci}$ and η_{ct} denote fixed effects; ε_{cit} is the idiosyncratic random error of the regression.

We include the log USA multi-factor productivity for industry in order to control mainly for exogenous technical changes at industry level. We choose the USA, which is at the world productivity frontier in most industries, as an appropriate reference country for our analysis.

The direct price impact indicator D_p_{cit} is simply defined as the logarithm of the production price index relative to the GDP price index. The indirect price impact indicator is a composite indicator of production prices for the upstream industries: $I\_p_{cit} = \sum_j p_{cjt} * USE_i^j$, where USE_i^j is the intensity-of-use of intermediate inputs, defined as the ratio of the intermediate consumption of industry i from industry j over the production of industry i and measured on the basis of the 2000 input-output table for the USA, taken as the country of reference in our analysis. Interacting the log upstream industry price with the intermediate input intensity-of-use ratio is an appropriate way of taking into account the intrinsic heterogeneity of upstream industry prices potential impact on downstream multi-factor productivity, assuming that the higher this ratio, the higher the impact of a given change in the upstream industry price.[2]

The wage impact indicator is defined as $J\_w_{cit} = w_{ct} * SHARE_i$, where w_{ct} is the country's real wage index, in logarithm, and $SHARE_i$ is the share of labor costs in the production value of industry i for the USA in 2000. As in the case of the indirect price impact indicator, we deem appropriate to interact the country's wage with the labor cost share, assuming that the higher this labor cost share, the higher the impact of a given change in the low- and high-skilled industry wage.

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[2] We prefer to use the USA 2000 input-output table as a weighting fixed reference in the computation of the intensity-of-use ratios to avoid endogeneity biases that might arise from potential correlations between the country*industry changes in such ratios and productivity. For similar reasons: (i) we also exclude the intra-industry intermediate consumption in the computation; and (ii) the wage indicator presented further relies on the USA 2000 industry labour shares as fixed reference.

II. Estimation and main results

A few words on the estimation strategy are useful. Entering η_{ci} in regression (1) is a necessity in the present context since our price and wage indicators do not measure absolute levels but are computed from price and wage indices normalized to be equal to 1 in a given reference year. Including also the country*year fixed effects η_{ct} protects against various sources of potential estimation biases, for example simultaneity biases due to changes in prices and wages in response to country productivity shocks.[3] All the estimated coefficients are statistically significant at 1%. The direct and indirect price impact and wage impact indicators have a negative effect on productivity, as well as the wage impact indicator, with elasticities of about 0.4, -0.5 and -2.1 respectively. These estimated elasticities are not statistically different when the impact indicators are included separately in the regression (see Cette, Lopez and Mairesse, 2014).

As a variant of regression (1), we also consider a specification that distinguishes between the impacts of manufacturing and non-manufacturing production prices. This distinction is important in order to compare our results with previous studies that focus only on non-manufacturing industries, as most anti-competitive regulations are concentrated on these industries in OECD countries. As we expect the impact of labor market rigidities on wages to depend on worker skills, our alternative specification also distinguishes between the impacts of low- and high-skilled wages.

All six estimated elasticities for this alternative specification are again negative and statistically very significant. We find very large and significant differences between the manufacturing and non-manufacturing direct and indirect price impact estimated elasticities and the low and high-skilled wage impact estimated elasticities. The direct impact estimated elasticity for non-manufacturing industries is twice that for manufacturing industries (about -0.8 versus -0.4) and the indirect impact estimated elasticity is ten times higher (about -5.0 versus -0.5). The wage impact estimated elasticity for high-skilled workers is twice that for low-skilled workers (-3.0 versus -1.7).

III. Simulations of the potential impact of structural reforms

The estimation results for regression (1) cannot unambiguously be interpreted in terms of productivity impacts of anti-competitive regulations in the product and

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[3] We also implement the Dynamic OLS (DOLS) estimator, which has the advantage of ensuring that the estimated elasticities are not biased by short-term correlations between the variables and the idiosyncratic error ε_{cit}, and that we can consider them as long-term parameters.

labor markets, and thus cannot directly be used to assess the potential effects of structural reforms in these markets. Moreover, despite the great care we have taken to avoid specification error biases in estimating our regression model, it is indeed important to confirm that production prices and wages indirectly capture the impacts of regulations. We address these two issues by calibrating them in relation to the OECD Employment Protection Legislation (*EPL*) indicators on the one hand and to the OECD Non-Manufacturing Regulation (*NMR*) and Harmonized Tariff (*HT*) indicators on the other (note that the HT indicator is available only for manufacturing industries). The OECD indicators are constructed on the basis of very detailed information on laws, rules and market, country, industry settings. They have the advantage of being directly related to underlying policies and considered to a major extent as exogenous to productivity developments (for more information on these indicators see Conway and Nicoletti, 2006, and OECD, 2013). The calibration we have performed simply amounts to four distinct OLS projections on the OECD indicators: two for non-manufacturing and manufacturing production prices on the *NMR* and *HT* indicators respectively, and two for low-

and high-skilled wages separately on the *EPL* indicators. The estimated coefficients corroborate our hypotheses that changes in production prices and wages are positively and significantly related to changes in the OECD regulation indicators.

By means of this calibration we can interpret and assess the estimates of the productivity regression in terms of an illustrative simulation of the potential long-term *MFP* gains by country. This simulation is an ex-ante assessment of the long-term effects of hypothetical regulatory reforms. We suppose for the purpose of this simulation that the "lightest practice" regulations observed in 2013 could be immediately enforced in all industries, where the "lightest practice" is defined as the average of the three lowest levels of regulations in the fourteen countries of our sample. Such a pervasive and simultaneous switch to "lightest practice" regulations is thus an overly extreme illustration of structural reforms in product and labor markets, which of course overlooks the numerous and substantial institutional and political difficulties of implementation. The simulation results are presented in Figure 1.[4]

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[4] The simulation results presented in Figure 1 mobilize the estimates of the alternative productivity specification that distinguishes between manufacturing and non-manufacturing production price impacts as well as low- and high-skilled wage impacts.
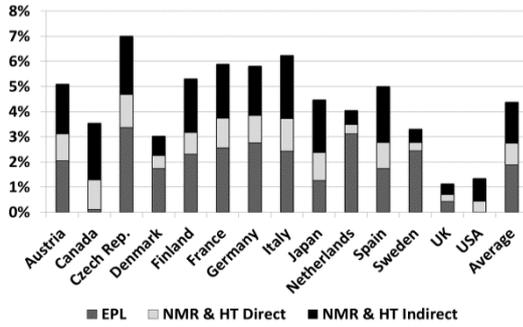
FIGURE 1. LONG TERM MFP IMPACT OF ADOPTION OF THE 'LIGHTEST PRACTICES'

The *MFP* long-term gains are on average of about 4.4%, but vary widely across countries: below 1.5% in the two countries with the lowest level of regulations: the United Kingdom (1.1%) and the United States (1.3%), and above 5% in the four countries with the highest level of regulations: Germany (5.8%), France (5.9%), Italy (6.2%) and the Czech Republic (7.0%). Both product and labor market reforms contribute significantly to *MFP* gains (2.5% and 1.9% on average, respectively). The former stems mainly from the indirect channel: average *MFP* gains from the indirect impact of *NMR* and *HT* are about twice those of the direct impact (1.6% and 0.9%, respectively).

The average and country simulated *MFP* impacts of a sudden shift to the lightest regulatory practices shown in Figure 1 are long-term gains. On the basis of a complementary approximate analysis of the respective dynamic adjustments of the changes in *MFP*, production prices and wages and OECD indicators, we can get an idea of the overall speed of progression towards the long-term equilibrium. The results are presented in Figure 2 for six European countries and the United States. They suggest that on average about 30% of the long-term *MFP* gains could be achieved after six years on average.
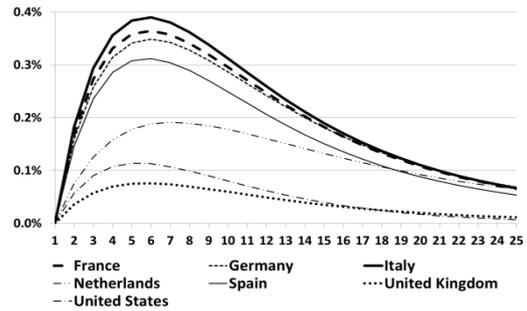

FIGURE 2. DYNAMIC MFP GAINS FROM THE ADOPTION OF THE 'LIGHTEST PRACTICES' – FOR A SUBSAMPLE OF COUNTRIES

IV. Conclusion

The simulation presented above suggests that nearly all countries, in particular European countries, can expect significant gains in multi-factor productivity over time from economic policies reforming anti-competitive regulations on the product and labor markets.

Our estimates and simulations suffer clearly from various weaknesses, due in particular to the data limitation. They should be taken with particular caution and the policy indications that they suggest considered as tentative. In particular, we do not take into consideration in our analysis the substantial institutional, political and

social difficulties that the implementation of such ambitious structural reform programs usually encounter.

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