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The Employment Impact of Product Market Regulation: Evidence from European Regions

Océane VERNEREY and Jimmy LOPEZ

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Abstract

We investigate the labor market effects of product market regulation on a sample of 37 million individuals from 191 regions in 19 European countries for the period 1998–2017. We find: (i) a detrimental impact of the network regulation on activity, unemployment and employment rates, particularly for the most vulnerable populations; (ii) insignificant or small effects of retail regulation; and (iii) negative effects of professional services regulations on unemployment and activity rates that offset each other in terms of employment. According to our simulation, the expected employment gains from network regulation reforms are substantial for many countries.

Keywords: Regulation, Competition, Employment

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1 Introduction

Competition is an important determinant of growth (see Aghion et al. (2009) for a literature review). Among the policies affecting competition, an abundant literature focuses on anti-competitive Product Market Regulation (PMR), i.e.„ network, retail and professional services regulation that limit competition through barriers to entry or direct state intervention, using OECD PMR indicators. This literature finds significant PMR impact on innovation and productivity, with strong effects even on non-regulated industries through production and consumption of intermediate inputs (e.g.„ Barone & Cingano, 2011, Cette et al., 2013). These anti-competitive regulation should also make a big impact on employment, at least through their innovation and productivity effects.[1] However, few papers investigate the employment effects of these regulation.

Using country level panel data, Bassanini & Duval (2006), Piton & Rycx (2018), Berger & Danninger (2007) and Boeri et al. (2000) find detrimental effects of PMR on employment. Using sector level data, Nicoletti et al. (2001) and Nicoletti & Scarpetta (2005) find negative effects on the employment level in the regulated sectors. However, there are several sources of endogeneity when investigating the impact of PMR, from omission bias to reverse causality if governments react to labor market changes by implementing regulatory reforms. In this paper, we provide an identification strategy that estimates causal effects of PMR on the labor market.

Most investigations of the PMR impact on innovation or productivity use cross-country-industry panel data, as PMRs are implemented at this level. However, workers are mobile between sectors so employment, unemployment and activity rates must be calculated on local labor markets or on aggregates of these markets (the regional labor markets in this paper). In the same way, firm level investigations may identify the impact of regulation on innovative firm employment, but miss the spillover effects on other firms due to the creative-destruction process. Therefore, our approach must identify the causal effects on regional labor markets of regulation defined at the sector level in a given country. To overcome this challenge, we bring together individual, sectoral and regional data, using the EUrostat Labor Force Survey (EU-LFS) and OECD PMR databases to build our individual level estimation sample covering 191 regions from 19 European countries over the 1998–2017 period and 37,663,754 observations. This sample covering many countries over a long period is required to test our main research hypothesis that the impact of a sector regulation on a regional labor market grows with the size of this sector in the region.

We find a detrimental impact of the network sector regulation on activity, unemployment and employment rates. This impact is particularly strong for the most vulnerable populations, i.e., young or old workers as well as poorly educated workers. The retail regulation effects are insignificant or small, while we find two

1. Direct effects on the labor market are also likely, particularly for professional services where the distinction between product and labor market regulation is not obvious. For instance, legal requirements to practice certain professions are generally considered as product market regulation but are also obviously labor market regulation.

strong opposing effects of professional services regulation that offset each other: an increase in the regulation constraints lead to a decrease in the activity and unemployment rates. These results emphasize the need to distinguish between sectors when making policy recommendations. According to our simulation, the expected employment rate gains from reforms of the network sector regulation may be substantial, with an average effect of 1.1%.

The paper is organized as follows. Sections 2 and 3 present our data and estimated model, respectively. Section 4 shows the main estimation results and the sensitivity analysis. The estimated values of regulation indicator effects are difficult to interpret directly, so section 5 provides simulations to illustrate the economic significance of our results. We conclude in section 6 and outline the next part of our research program.

2 Data

Using the EUrostat Labor Force Survey (EU-LFS) and OECD PMR databases, we build an estimation sample of 37,663,754 observations of people between 15 and 66 years old. When estimating the PMR effects on unemployment probability, the sample is reduced to the 25,922,616 observations of the active population. These samples cover 191 regions in 19 European countries over the period 1998–2017. Observations do not begin in 1998 for all countries, but the last year available is in all cases 2017 and when a country is included in the sample all its regions are observed (see Figure 1 for information on the first year of data availability for each country). This section presents our data sources and variables.

2.1 OECD Product Market Regulation database

There is an abundant literature using OECD anti-competitive Product Market Regulation (PMR) indicators. These indicators are based on detailed information on laws, rules and market settings in order to measure the extent to which competition and firm choices are restricted when there is no a priori reason for government interference, or when regulatory goals could plausibly be achieved by less coercive means. They cover: (i) the network sector including energy (gas and electricity), transport (rail, road and air) and communications (post, fixed and cellular telecommunications) subsectors; (ii) retail distribution; and (iii) professional services (accountants, lawyers, notaries, architects, engineers, estate agents).[2]

The regulatory constraints on competition taken into account could be direct state intervention as well as barriers to entry (see Vitale et al., 2020, for details). For the professional services sector, the OECD anti-competitive PMR indicator includes regulation that may also be considered as labor market regulation, such

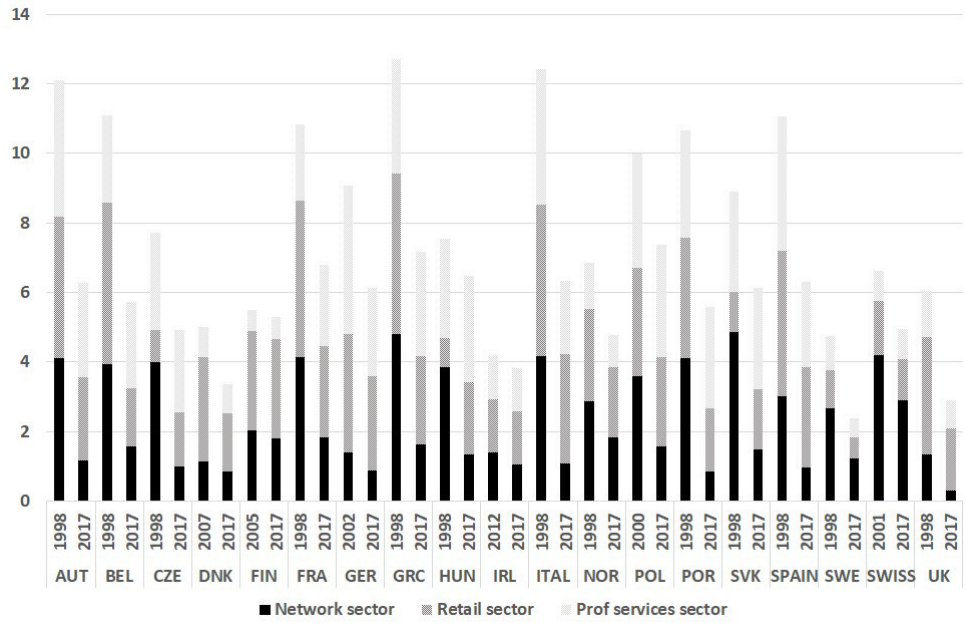
2. We should note that regulation comparisons across countries are particularly difficult for professional services. The activities that a specific profession undertakes may vary between countries. In particular, in civil law countries notaries perform administrative and judicial tasks by virtue of power delegated by the state; hence, they play a special role in the legal services market.

as legal requirements in order to practise certain professions. It reinforces the likelihood of a direct effect of these regulation on labor market outcomes.

The PMR indicators are available annually from 1975 to 2018 for the network sector and every five years from 1998 to 2018 for the retail and professional services sectors. We calculate annual data for these last two sectors by retropolation. The values of these indicators are between 0 and 6, with 0 denoting the most pro-competitive regulation. In our estimated specifications we introduce simultaneously the three sector-specific regulation indicators or their sum. Figure 1 presents for each country the values of these indicators for the first year they feature in our estimation sample as well as their values in 2017, which is always the last year available. It shows a marked fall in the indicators over the sample period, meaning that pro-competitive reforms have been implemented in most countries. It is also worth noting that there is strong heterogeneity between countries and a low correlation between the three regulated sectors: for a given country anti-competitive regulation may be strong in one sector and not in others.

Figure 1: Product Market Regulation indicators

Source: OECD PMR Database



2.2 European Labor Force Survey

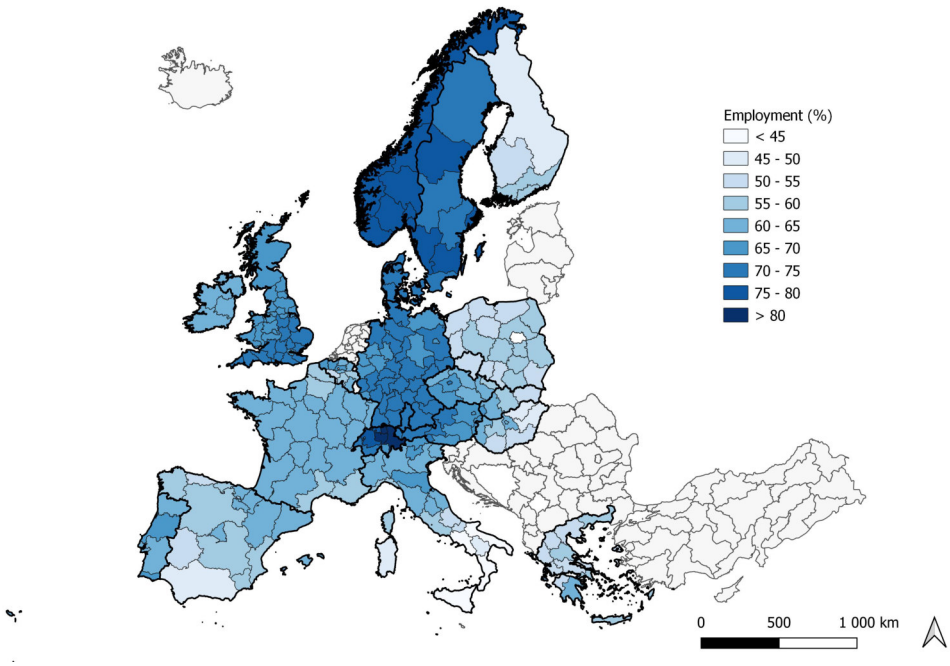
The EU-LFS Eurostat database provides harmonized information on employment status and various individual characteristics for people aged over 15 in all European countries from 1983 (or from joining the European Union for more recent members) to 2017. It is particulalry helpful that our estimation sample includes a large number of countries to identify PMR effects. However, the Eurostat database

available for research is anonymized. As a result: (i) we are unable to follow individuals over time; (ii) some variables are excluded; and (iii) the values of others are aggregated at a higher level. In particular, the localization is only at the NUTS2 level which corresponds to the administrative regions in most countries.[3]

Our investigation uses the person's employment status and the following individual characteristics: age, education, gender, sector and region. Education is broken down into three levels: (i) high, with at least some higher education; (ii) medium with baccalaureate; and (iii) low. These three educational levels correspond respectively to 20%, 46% and 34% of the estimation sample. We distinguish among 10 age groups as explanatory variables, but when we break-down the sample into subgroups in section 4 we use only three age groups, 17–26, 27–56 and 57–66 years old, corresponding to 17%, 62% and 21% of the estimation sample. Figures 2 present the employment rate by region and shows a wide dispersion between countries and also between the regions of one and the same country (countries for which data is unavailable are shown in grey).[4]

Figure 2: Employment rate, regional averages

Source: Authors' calculations using the EU-LFS database



3. For Austria, Germany and the United Kingdom, the localization is observed only at the NUTS1 level, i.e., large socioeconomic regions.

4. Unemployment and activity rate regional averages are presented in the Supplementary Appendix and show a similar distribution to Figure 2. Indeed, there is a strong negative correlation between unemployment and activity rates: overall, a low employment rate corresponds both to a high unemployment rate and a low activity rate.

3 Estimated model

3.1 Introduction of our identification strategy

There are several papers investigating empirically the impact of anti-competitive regulation on innovation or productivity. As these regulation are implemented at the sectoral level, most of these estimations use cross-country-sector panel data. Moreover, numerous measures of innovation and productivity are available at this level. However, this is not the most relevant meso-economic level for investigating the effects on employment. Indeed, workers are mobile between sectors, so there are no employment, unemployment or activity rates defined at the sector level. The preferred level of analysis for employment would be local labor markets, i.e., geographical areas within which most workers reside and work, and in which establishments can find most of the labor force needed to fill the jobs offered. As already mentioned, the anonymized EU-LFS database provided by Eurostat is available only at the NUTS2 level, which is more aggregated than local labor markets. This localization level is still useful. Indeed, our identification assumption here is only the lack of workers' mobility between the geographical units and only 0.74% of the workers in our sample were in another region the previous year. Worker mobility is particularly low for low-skilled and elderly workers: 0.47% and 0.31% respectively.

Our approach must identify the causal effects on regional labor markets of regulation defined at the sector level in a given country. For this purpose, our main research hypothesis is that the impact of a sector regulation on a regional labor market grows with the size of this sector in the region, measured by the share of workers in this industry among the whole set of workers in this region.[5] To avoid endogeneity issues, we use shares computed before the estimation sample. These shares are good approximations of the yearly in-sample shares because of the persistence of regional specialization in regulated industries. Indeed, using yearly in-sample shares we find that regional fixed effects explain 70% of the variability of these shares in the network sector, 79% in the retail sector and 87% in the professional services sector.

3.2 Estimated specification

According to our identification strategy, the estimated equation could be written as follows:

$$EMPR_{rt} = \alpha + \sum_{j} \beta^{j} \left(w_{r}^{j} \times PMR_{ct}^{j} \right) + \phi_{r} + \phi_{ct} + \epsilon_{rt} \tag{1}$$

5. To go one step further in the interpretation of our results, it is worth remenbering that regulation may have a direct impact on the activity of the regulated industries, but also an indirect impact on the activity of other sectors. Regulated industries are important producers of intermediate inputs and the empirical literature has shown that what happens in these sectors will make a big impact on the others through this channel. For a region with a large proportion of workers in the regulated sector, this indirect effect should be higher, too. Therefore, we expect our estimations to capture the effects on employment from both the direct and indirect effects of regulation.

Where: $EMPR_{rt}$ is the employment rate in region r and year t; w_r^j the share of region r workers engaged in the regulated sector j; PMR_{ct}^j the OECD indicator of sector j anti-competitive PMR in country c and year t; ϕ_r and ϕ_{ct} region and crossed country-year fixed effects; and ϵ_{rt} are region-year residuals. For convenience, the product $w_r^j \times PMR_{ct}^j$ is called hereafter the "regulatory burden" indicator. This last variable allows us to test our main research hypothesis that the impact of sector regulation grows with the size of this sector in the region.

The choice of fixed effects is particularly important for our identification strategy. Of course, the region fixed effects prevent potential omission bias linked to regional characteristics such as resource while crossed country-year fixed effects prevent country-year omited variables, such as macroeconomic shocks. Moreover, crossed country-year fixed effects also prevent reverse causality bias if governments react to country-year employment rate changes by implementing regulation reforms. These fixed effects mean that the β^j parameters must be interpreted as the difference of impact between regions depending on their sector specialization.

Equation (1) shows in a simple way how our identification strategy is transposed in the estimated equation. However, to take advantage of our individual level database and obtain more precise estimates, our main estimated equation is:

$$EMP_{it} = \alpha + \sum_j \beta^j \left(w_{rj} \times PMR_{jct}\right) + \sum_p \beta^p x_{it}^p + \phi_r + \phi_{ct} + \epsilon_{it} \qquad (2)$$

Where: EMP_{it} is a dummy variable equal to one if the individual i works in year t and 0 otherwise; x_{it}^p a set of control variables: gender, 3 education levels and 10 age groups; and ϵ_{it} the residuals.[6]

To study the relationship between employment and anti-competitive regulation in depth, we estimate equation (2) on the whole sample as well as on subsamples depending on education or age of the workers and we also investigate the regulatory burden effects on people's activity and unemployment status.

4 Estimation results

4.1 Main estimation results

We estimate equation (2) using the probit estimator and interpret in this section the estimated average marginal effects on employment, activity and unemployment probabilities. The dependent variable is defined at the individual level whereas the regulatory burden ($w_{rj} \times PMR_{jct}$) is defined at the regional level, which could induce a strong clustering issue leading to the precision of the estimations being overstated. Therefore, we use "clustered" standard errors, i.e., standard errors corrected according to the "Moulton factor" taking into account the within-region correlations of the residual term and explanatory variables.[7]

6. There are no individual fixed effects because individuals are not observed over time in our database.

7. The "Moulton factor" in our main estimations is calculated specifically for each year. The sensitivity of estimation results to this choice is discussed in the sensitivity analysis subsection.

Figure 4 shows the estimated marginal effects of our control variables on an individual's employment, unemployment and activity status.[8] Well-educated middle-aged men have the highest activity and employment probability. Highly educated men are also less likely to be unemployed than women and poorly or averagely educated workers. The unemployment probability is the lowest for older workers, for whom the propensity to leave the labor market is probably high when they lose their jobs.

Figure 3: Estimated marginal effects of control variables

Dependent variable: Employment
Reference: Young (17–21) poorly educated women
All the estimated coefficients are statistically significant at the 1% threshold

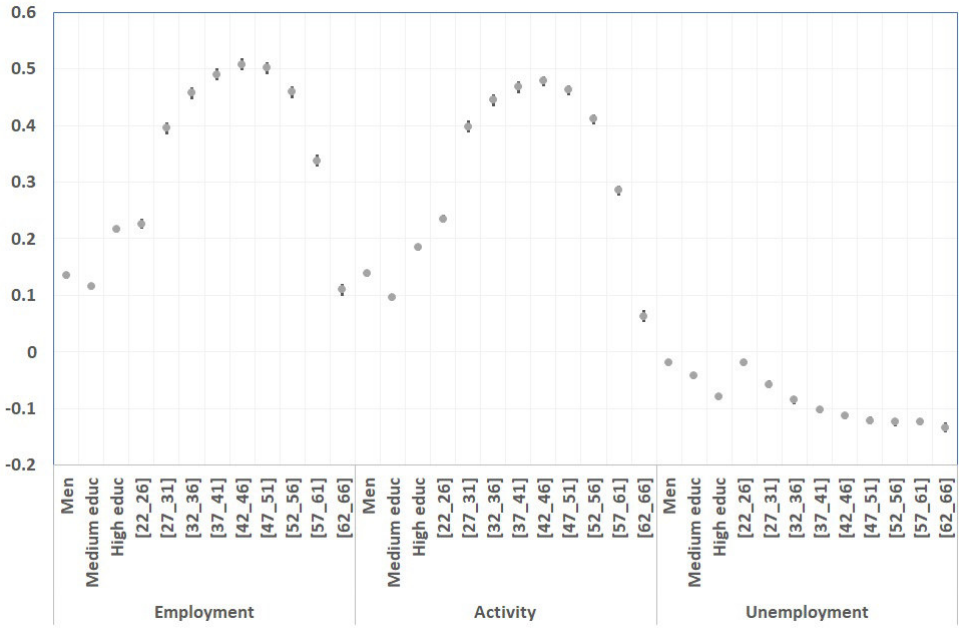


Table 1 shows the estimated marginal effect of the regulatory burden ($w_r^j \times PMR_{ct}^j$) for the network, retail and professional services sector indicators or for their sum.[9] These effects are estimated for the whole set of individuals or for subsamples depending on the individuals' level of education or age.[10]

8. Figure 4 shows the results corresponding to Table 1 columns (1), (3) and (5) estimations, but these results are very similar for all the other estimations presented in Table 1.

9. A one-unit change in the regulatory burden is not meaningful. Therefore, we mainly interpret the sign and statistical significance of the estimated results in this section and illustrate the economic significance of the results in the simulation section. However, in order to give some economic significance to the estimated results from this section it could be interesting to note that the regulatory burden indicator for all regulated sectors has decreased by 0.34 units on average over the whole estimation period.

10. We also estimate the effects on gender subsamples and find no significant differences between the estimated coefficients for the two genders.

For the whole sample, using the sum of the regulatory burdens from the three sectors we find a negative impact on employment probability (col. 1) resulting from two opposing effects: an increase in regulatory burden reduces activity probability (col. 3) but also unemployment probability (col. 5), the former being higher than the latter. However, only the regulatory burden from the network sector has a significant negative effect on employment probability (col. 2). Indeed, all of the three sector regulation have negative effects on activity probability (col. 4), but only network regulation have a positive effect on unemployment probability, while retail and professional services regulation have negative effects on unemployment (col. 6) that offset their effects on activity, thus leading to no significant impact on employment probability (col. 2). The retail regulation effects on activity and unemployment probabilities are invariably much smaller than the network and professional services regulation effects. These results for the whole sample emphasize that it is important for policy recommendations to distinguish the different sectors' regulation.

We then estimate equation (2) on subsamples (col. 8, 10, 12, 14, 16, 18). We find that the effect of the regulatory burden from the network sector is particularly strong for the most vulnerable populations, i.e.„ poorly educated workers, the oldest and, to a lesser extent, the youngest. For the oldest workers, the effect of the network regulation mainly involves the activity probability. The regulatory burden from the professional services sector has negative effects on both the activity and unemployment probability whatever the level of education and age, but finally in terms of employment probability it leads to: (i) detrimental effects for poorly educated workers and the oldest workers; and (ii) positive effects for highly educated workers as well as the youngest workers. This last effect on the youngest corresponds to a very strong negative effect on the unemployment probability that may be explained by the legal requirement required for access to regulated professions. The effects on the activity and unemployment probability of regulatory burden from the retail sector are invariably negative when they are statistically significant, but they are also always much smaller than for the professional services sector regulation, except for the impact on the unemployment probability of the oldest workers, which are comparable. Finally, the burden from the retail sector regulation has no impact on the employment probability whatever the age of the worker and it has a small but statistically significant impact only for poorly educated workers.

Table 1: Estimated marginal effect of the regulatory burden

Dep. var.	**Employment**				**Activity**				**Unemployment**			
Regulations	All reg. sectors	Network	Retail	Prof. services	All reg. sector	Network	Retail	Prof. services	All reg. sectors	Network	Retail	Prof. services
	(1)	(2)			(3)	(4)			(5)	(6)		
Whole pop.	−0.044***	−0.165***	−0.024	0.010	−0.095***	−0.101***	−0.056**	−0.246***	−0.031***	0.090***	−0.042**	−0.346***
	(0.017)	(0.029)	(0.026)	(0.045)	(0.014)	(0.027)	(0.022)	(0.060)	(0.011)	(0.024)	(0.019)	(0.051)
Education	(7)	(9)			(11)	(13)			(15)	(17)		
Low	−0.022	−0.259***	0.100***	−0.124***	−0.074***	−0.172***	0.002	−0.321***	−0.049***	0.141***	−0.089***	−0.260***
	(0.019)	(0.031)	(0.028)	(0.047)	(0.014)	(0.028)	(0.023)	(0.057)	(0.013)	(0.024)	(0.021)	(0.053)
Medium	−0.088***	−0.106***	−0.038	0.067	−0.127***	−0.046	−0.105***	−0.188***	−0.006	0.074***	−0.008	−0.350***
	(0.018)	(0.031)	(0.027)	(0.046)	(0.014)	(0.028)	(0.023)	(0.055)	(0.012)	(0.024)	(0.020)	(0.054)
High	−0.049***	0.039	−0.010	0.093**	−0.080***	0.061*	−0.054**	−0.198***	−0.006	−0.000	0.012	−0.396***
	(0.019)	(0.034)	(0.028)	(0.047)	(0.015)	(0.031)	(0.023)	(0.056)	(0.012)	(0.026)	(0.020)	(0.055)
Age	(8)	(10)			(12)	(14)			(16)	(18)		
17 to 26	−0.060***	−0.253***	−0.032	0.214***	−0.109***	−0.157***	−0.081***	−0.192***	−0.032***	0.134***	0.004	−0.565***
	(0.018)	(0.035)	(0.026)	(0.052)	(0.014)	(0.031)	(0.022)	(0.065)	(0.012)	(0.026)	(0.019)	(0.052)
27 to 56	−0.023	−0.095***	0.039	0.040	−0.077***	−0.021	−0.050**	−0.195***	−0.032***	0.099***	−0.045**	−0.301***
	(0.017)	(0.032)	(0.026)	(0.042)	(0.014)	(0.030)	(0.023)	(0.056)	(0.011)	(0.024)	(0.019)	(0.049)
57 to 66	−0.148***	−0.641***	−0.023	−0.240***	−0.199***	−0.576***	−0.132***	−0.354***	−0.065***	0.042*	−0.133***	−0.097**
	(0.019)	(0.040)	(0.028)	(0.051)	(0.016)	(0.037)	(0.024)	(0.063)	(0.012)	(0.025)	(0.020)	(0.047)
Observations	37663754	37663754			37663754	37663754			25922616	25922616		

Fixed effects: Country, region, year, and country*year;
Control variables: Age, education, and gender.
Clustered standard errors in parentheses; $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

4.2 Sensitivity analysis

When analyzing the sensitivity of the estimation results, our first concern is the consequence of the cross-sectional and over time correlations of the explanatory variables and residuals. Then, we investigate the sensitivity to the set of fixed effects and to various estimation samples.[11]

In our main estimations, we deal with cross-sectional correlation of residuals and the explanatory variables at the regional level by region-year "Moulton factor" correction of the standard errors. It is particularly important to focus on this issue because of the region-year dimension of the regulatory burden indicators. This correction method has good asymptotic properties and we have a large number of region-years in our sample (3,576). Another possibility to avoid this cross-sectional correlation issue is to estimate our specification on regional level averages. The main drawback with this alternative method may be a loss in the precision of our estimates, in particular for the effects of individual characteristics.

When estimating equation (2) using region-year averages, a main difference in the estimation results compared to Table 1 applies to the control variables: there are neither gender effects nor premiums for being highly educated compared with being averagely educated. The estimated network regulation effects are very similar to the results in Table 1 and still strongly significant. The retail and professional services regulation still have a negative impact on activity and unemployment probabilities. However, the size of the negative impact on activity probability increases for the retail regulation and decreases for the profesional services regulation. Therefore, when using region-year averages, retail regulation have a significant negative impact on employment probability (but it is much smaller than for the network regulation) while professional services regulation have a positive impact on this probability. These results emphasize the difference in effects between network and professional services regulation.

The method used for estimating the results in Table 1 does not deal with the issue of correlation of the residuals over time. One way to take into account both cross-sectional and over time correlations simultaneously would be to use region clusters rather than region-year clusters. This would greatly reduce the number of clusters, which is why we prefer region-year clusters in our main estimates. Assuming region clusters, we still find a strongly significant negative impact of network regulation employment probability, as well as a significant negative impact of professional services regulation on activity and unemployment probability. However, the other estimated impact of regulation on the whole sample are no longer statistically significant. Taken together, the estimates on region-year averages or using region clusters shows the robustness of the network regulation effects on employment and emphasizes also a more surprising result, the negative impact of professional services regulation on unemployment.

The sensitivity analysis of the choice of fixed effects is particularly interesting. In our main specification, we introduce country-year fixed effects to prevent omission and reverse causality bias, as already mentioned. When these country

11. The estimation results discussed in this subsection are presented in the Supplementary Appendix.

fixed effects are removed from the estimated specifications, the results change drastically.[12] This shows that there are strong correlations between regulation and employment changes at the country level and that it is essential to use an identification strategy.

Finally, we investigate the estimation sample sensitivity of the results. We find that our results are robust to the exclusion of any country from the estimation sample. For convenience, we have chosen to present estimation results in Table 1 for subsamples defined by education level or age group. When we estimate equation (2) on age × education subsamples, we find estimation results consistent with the results in Table 1. Moreover, it is interesting to note that the negative effects on employment of network regulation for middle-aged workers and of professional services regulation for oldest workers are driven exclusively by the poorly educated workers among these age groups.

5 Simulation

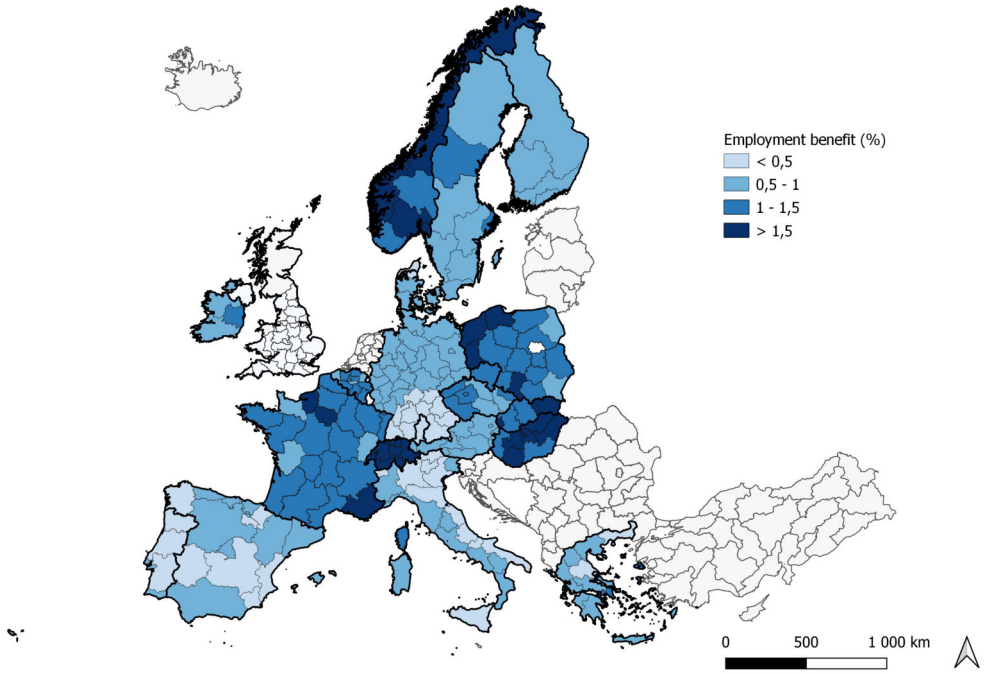
The previous section presents the marginal estimated effects of the regulatory burden indicators. They are difficult to interpret directly because this indicator is the product of workers' shares with regulation indicators. To illustrate the economic significance of these results, we provide in this section simulated effects of regulation reforms based on them. We focus first on the impact on employment probability for the whole population, in order to get the broader picture, and so we take into account only network sector regulation as the other regulation have no significant impact on this probability.

The reform considered in our simulation is a switch in 2018—the last year available—of the network regulation indicator toward our sample "lightest practices", i.e.„ the smallest observed value of the indicators the same year. Figure 1 in the Data section shows that the lighest practices are in the UK and that this switch may reflect major reforms in many countries. We then compute the corresponding change in regulatory burden using the regional shares of workers engaged in the regulated sector as in equation (2) and the estimation results in Table 1 column (2) to calculate the effects of the reform on employment probability.

Figure 5 shows the calculated effects of these reforms. The average regional effect is of 0.94%. The greatest effect is in Switzerland (up to 2.41% in Nordwestern) as the network regulation are particularly stringent. There are also major effects in some Polish regions were the network sector is strongly developed: Zachodniopomoskie (1.91%) and Pomorskie (1.88%).

12. Compared to the main estimates, we find opposing effects of network regulation on activity, unemployment and employment probability. Rather than no significant effect of professional and retail services on employment, we find a significant negative effect of professional services regulation, as there is still a negative effect on activity probability and no longer a significant effect on unemployment rate, and a positive significant effect of retail services, because of a negative impact on unemployment and a positive impact on activity.

Figure 4: Employment impact of network regulation reforms



Lecture note: if France adopted the United Kingdom's network regulation (i.e., the "lightest practices"), the employment rate in most French regions would increase by 1–1.5%

We then compute country level aggregated effects, using 2017 regional shares in country employment as weights, for reforms in the three regulated sectors and for individual's employment, activity and unemployment status (all the results are shown in the Supplementary Appendix). The country impact of the network reforms on employment probability is of 1.1% on average. This corresponds to an average positive impact of 0.7% on the activity probability and a negative impact of 0.6% on the unemployment probability. For the professional services and retail sectors we found in the previous section that there is no significant effect on employment probability. Concerning the activity and unemployment probability, our simulation indicates an average negative impact of the reforms of respectively 1.2% and 0.9% for the retail regulation and of 1.9% and 2.6% for the professional services regulation.

6 Conclusion

To our knowledge, this paper is the first to provide an identification strategy of the employment impact of anti-competitive PMR. We find a detrimental impact of the network sector regulation on economic activity, which is consistent with the literature on the PMR impact on innovation or productivity. This employment

impact is particularly strong for the most vulnerable populations. We also find small or insignificant effects of the retail regulation and two opposing effects of professional services regulation: an increase in the regulatory constraints would lead to a decrease in both the activity and unemployment probabilities. Our estimations lead also to two results that would merit further attention in subsequent papers: a strong negative effect of professional services regulation on unemployment probability of the youngest and a positive impact of retail regulation on the employment of poorly educated workers.

In the simulation section, we show that expected employment gains from reforms of the network sector regulation may be substantial, with an average effect of 1.1%. It is important, however, to note that this would required very ambitious reforms in some countries.

Our motivation in investigating the PMR impact on employment is grounded on the potential direct effects of some of these regulations on the labor market, but also on the previous empirical literature finding significant effects of anti-competitive PMR on innovation and productivity through their effects on competition (e.g.„ Cette, Lopez & Mairesse, 2016). Indeed, these large effects on innovation and productivity may influence employement. Our findings confirm these assumptions. More work should be done to investigate the mechanisms in action in order to make more specific policy recommendations. In further research, we will: (i) investigate empirically the innovation and productivity channels between PMR and their employment effects; (ii) provide a theoretical framework; and (iii) use machine-learning methods to extend the study from the impact of sector indicators to the relations between employment and the hundreds of specific regulation that are observed to build these indicators.

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Anticompetitive Regulations Impact on Employment: European Regions Evidence

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Supplementary Appendix

1 Sensitivity analysis

1.1 Sensitivity to cross-section and over-time correlations

TABLE 1 – Estimated marginal effects using region-year averages

Dep. var.	Employment		Activity		Unemployment	
	(1)	(2)	(3)	(4)	(5)	(6)
All regulated sectors	-0.116***		-0.134***		0.015	
	(0.013)		*(0.011)*		*(0.015)*	
Network		-0.222***		-0.138***		0.168***
		(0.024)		*(0.021)*		*(0.027)*
Retail		-0.082***		-0.162***		-0.068***
		(0.023)		*(0.020)*		*(0.026)*
Pro. services		0.162***		-0.009		-0.217***
		(0.045)		*(0.040)*		*(0.050)*
Men	-0.007	-0.003	0.113***	0.113***	-0.044	-0.056*
	(0.037)	*(0.037)*	*(0.033)*	*(0.033)*	*(0.030)*	*(0.029)*
Medium educ.	0.326***	0.332***	0.212***	0.211***	-0.200***	-0.210***
	(0.016)	*(0.016)*	*(0.014)*	*(0.014)*	*(0.017)*	*(0.017)*
High educ	0.285***	0.302***	0.202***	0.210***	-0.200***	-0.211***
	(0.020)	*(0.020)*	*(0.017)*	*(0.018)*	*(0.019)*	*(0.019)*
Age :						
[22_26]	0.003	-0.025	0.139***	0.130**	0.051	0.069
	(0.060)	*(0.059)*	*(0.053)*	*(0.053)*	*(0.082)*	*(0.082)*
[27_31]	0.413***	0.368***	0.332***	0.319***	-0.295***	-0.253***
	(0.054)	*(0.054)*	*(0.048)*	*(0.048)*	*(0.072)*	*(0.072)*
[32_36]	0.441***	0.412***	0.346***	0.338***	-0.276***	-0.252***
	(0.051)	*(0.051)*	*(0.045)*	*(0.045)*	*(0.070)*	*(0.070)*
[37_41]	0.554***	0.523***	0.385***	0.379***	-0.406***	-0.380***
	(0.052)	*(0.052)*	*(0.046)*	*(0.046)*	*(0.070)*	*(0.069)*
[42_46]	0.341***	0.316***	0.209***	0.202***	-0.263***	-0.252***
	(0.058)	*(0.058)*	*(0.051)*	*(0.052)*	*(0.073)*	*(0.073)*
[47_51]	0.352***	0.323***	0.258***	0.248***	-0.268***	-0.252***
	(0.058)	*(0.058)*	*(0.051)*	*(0.051)*	*(0.071)*	*(0.071)*
[52_56]	0.366***	0.321***	0.155***	0.139***	-0.363***	-0.342***
	(0.053)	*(0.052)*	*(0.046)*	*(0.047)*	*(0.070)*	*(0.070)*
[57_61]	0.341***	0.295***	0.0862**	0.068	-0.522***	-0.490***
	(0.048)	*(0.048)*	*(0.043)*	*(0.043)*	*(0.072)*	*(0.071)*
[62_66]	0.039	-0.020	-0.218***	-0.235***	-0.685***	-0.610***
	(0.048)	*(0.048)*	*(0.042)*	*(0.043)*	*(0.079)*	*(0.079)*
Constant	0.251***	0.221***	0.573***	0.571***	0.465***	0.511***
	(0.045)	*(0.045)*	*(0.040)*	*(0.040)*	*(0.066)*	*(0.066)*
Observations	3,576	3,576	3,576	3,576	3,576	3,576
R-squared	0.982	0.982	0.980	0.980	0.940	0.941

Fixed effects: Country; region; year; country*year
Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

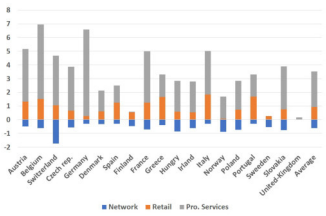
TABLE 2 – Estimated marginal effects of the regulation burden, using region clusters

Dep. var	Employment (1)	Activity (2)	Unemployment (3)
Network	-0.165***	-0.101	0.095*
	(0.065)	*(0.061)*	*(0.053)*
Retail	0.024	-0.056	-0.042
	(0.060)	*(0.042)*	*(0.040)*
Pro. services	0.010	-0.246*	-0.346***
	(0.103)	*(0.133)*	*(0.112)*
Observations	37,663,754	37,663,754	25,922,616

Fixed effects: Country; region; year; country*year; Control variables: age, education and gender;
Clustered standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

1.2 Sensitivity to the set of fixed effects

TABLE 3 – Estimated marginal effects of the regulation burden, sensitivty to the set of fixed effects



2 Estimation results by subsamples

Figure 1, 2 and 3 present the regulation burden effects on employment, activity and unemployment rates aggregated at the country level. They shows the estimated parameters as well as their 95% confidence interval. The non significant estimated effects at a 1% thresholds are in grey.

FIGURE 1 – Estimated marginal effects on the employment probability

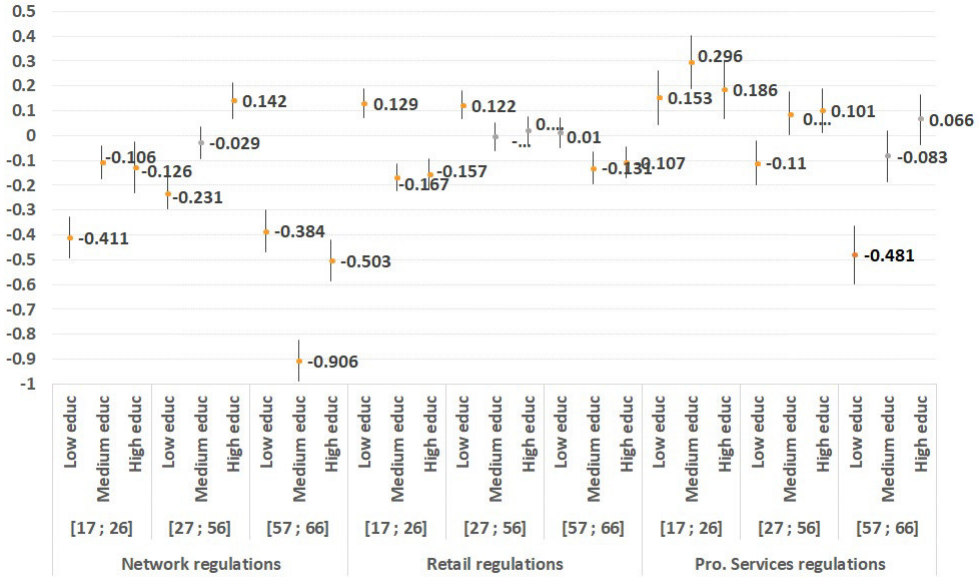


FIGURE 2 – Estimated marginal effects on the activity probability

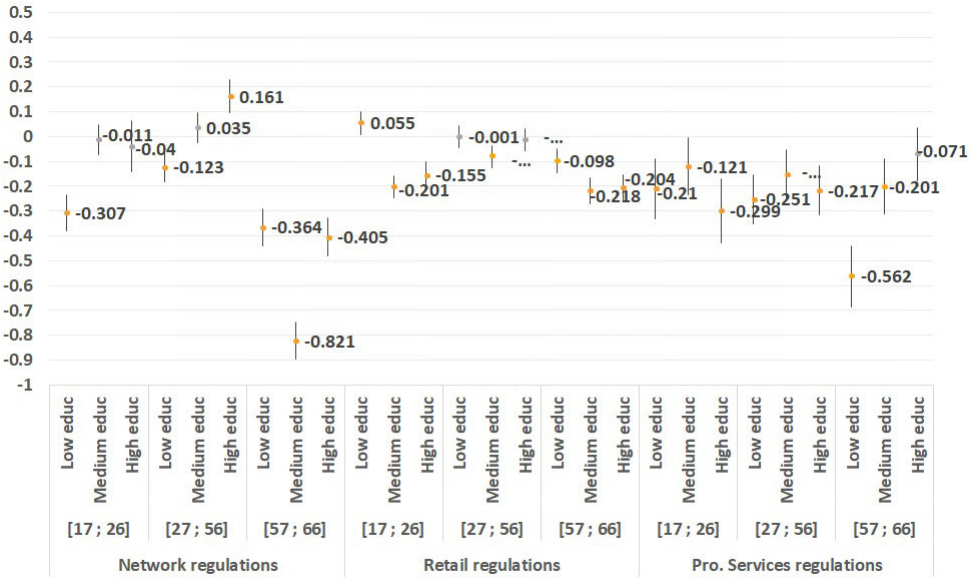
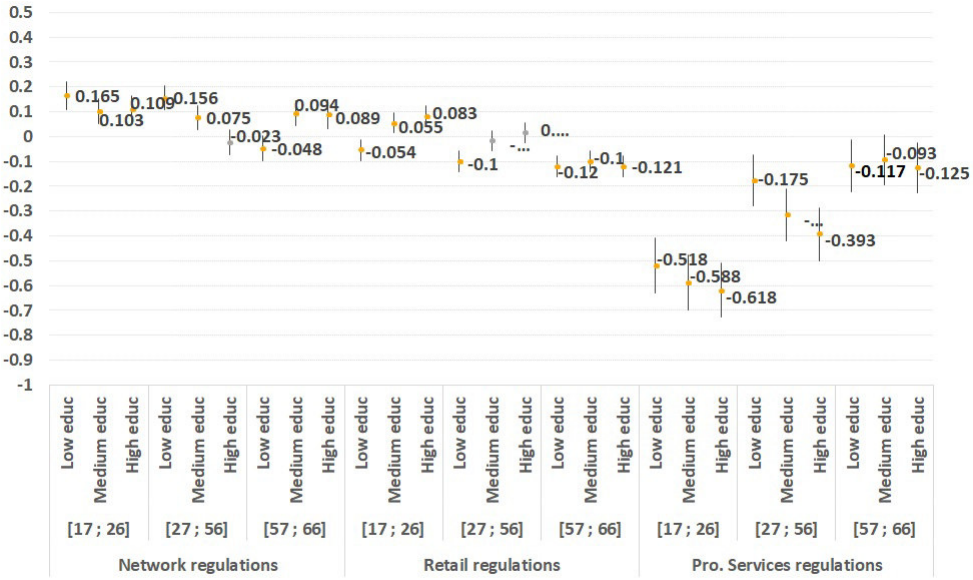


FIGURE 3 – Estimated marginal effects on the unemployment probability



3 Simulations : Country aggregated effects

FIGURE 4 – Impact on employment rate (in %) of a PMR switch towards the 'lightest practices'

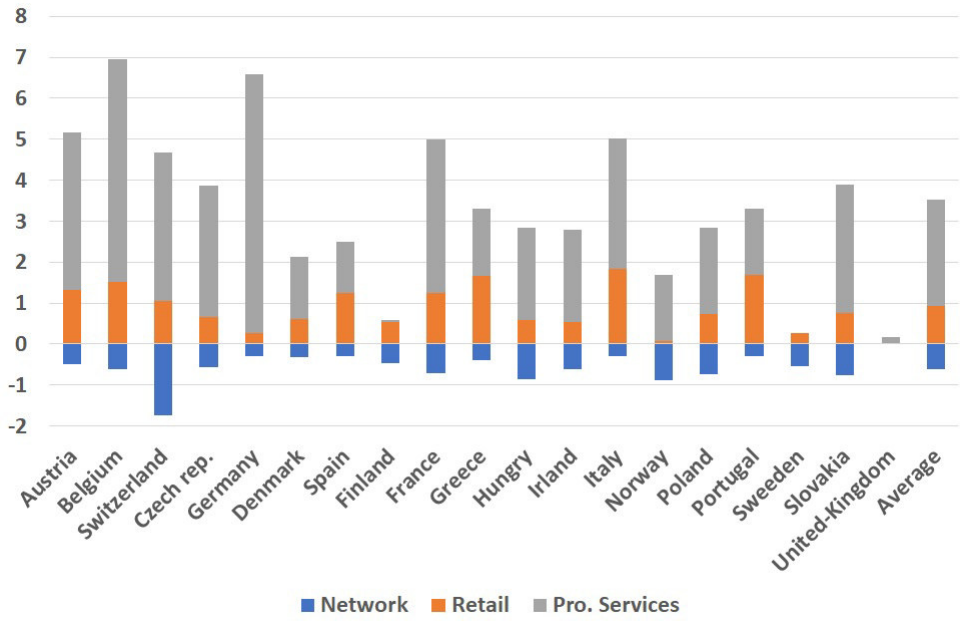


FIGURE 5 – Impact on activity rate (in %) of a PMR switch towards the 'lightest practices'

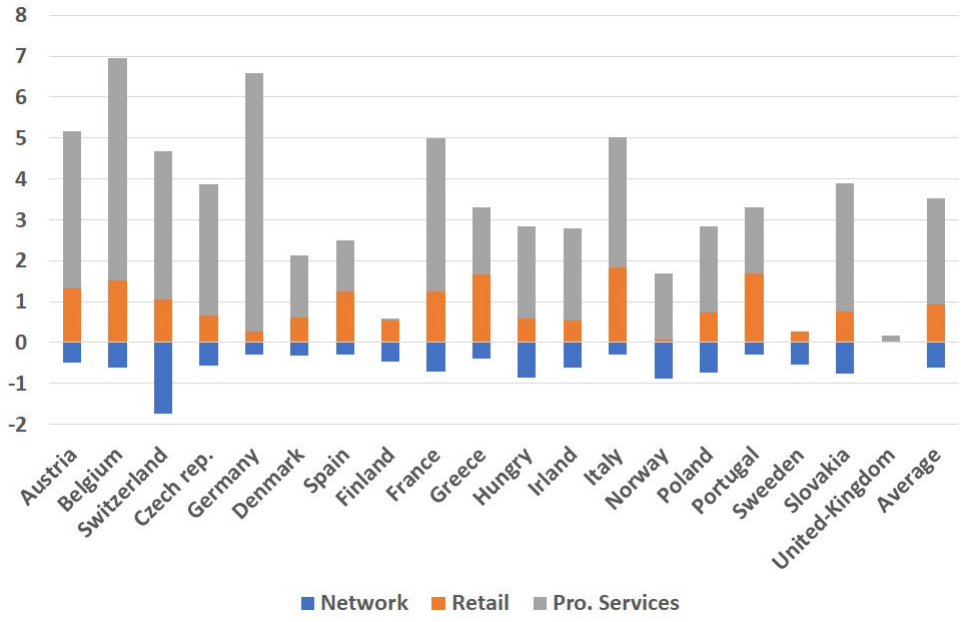


FIGURE 6 – Impact on unemployment rate (in %) of a PMR switch towards the 'lightest practices'