How EU Markets Became More Competitive Than US Markets: A Study of Institutional Drift*

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Abstract

Until the 1990's, US markets were more competitive than European markets. Today, European markets have lower concentration, lower excess profits, and lower regulatory barriers to entry. We document this surprising outcome and propose an explanation using a model of political support. Politicians care about consumer welfare but also enjoy retaining control over industrial policy. We show that politicians from different countries who set up a common regulator will make it more independent and more pro-competition than the national ones it replaces. Our comparative analysis of antitrust policy reveals strong support for this and other predictions of the model. European institutions are more independent than their American counterparts, and they enforce pro-competition policies more strongly than any individual country ever did. Countries with ex-ante weak institutions benefit more from the delegation of antitrust enforcement to the EU level. Our model also explains why political and lobbying expenditures have increased much more in America than in Europe, and using data across industries and across countries, we show that these expenditures explain the relative rise of concentration and market power in the US.

The United States invented modern antitrust in the late nineteenth and early twentieth century, and American consumers have enjoyed relatively competitive markets for goods and services ever since. Meanwhile, the American antitrust doctrine has spread globally, and, by the 1990's, a broad international consensus had emerged among policy makers in favor of US-style regulations for most markets. This was particularly true in Europe. Alesina and Giavazzi (2006), for example, argued that "*If Europe is to arrest its decline [..] it needs to adopt something closer to the American free-market model.*" We argue that, as far as antitrust and product market regulations are concerned, it did. Yet the US retained a head-start, and it had a longer history of independent enforcement.

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Given these initial conditions, one would have predicted that US markets would remain more competitive than European (EU) markets. But then something quite unexpected happened. US markets experienced a continuous rise in concentration and profit margins starting in the late 1990s. And, perhaps more surprisingly, EU markets did not experience these trends so that, today, they appear more competitive than their American counter-parts. Figure 1 illustrates these facts by showing that profit rates and concentration measures have increased in the US yet remained stable in Europe.[1] In addition, note that the increased integration among EU economies essentially shifts the appropriate measure of concentration from the red dotted line towards the blue line with triangles – which further strengthens the trend.

Our goal is to explain these trends, with a focus on Antitrust Enforcement and Product Market Regulation. Namely, we make three main contributions. First, we document the trends in Figure 1 at a granular level. Second, we propose a model to explain the relative evolution of Europe and the US. Third, we test the predictions of the model using European and American data.

To document the divergent trends, we consider multiple measures of concentration and profitability at both the aggregate- and industry-level. Across all measures, we find that concentration and profits have remained stable in Europe while they increased in the US. We then focus on industries with significant increases in concentration in the US, such as Telecom and Airlines, and show that these same industries have not experienced similar evolutions in Europe, even though they use the same technology and are exposed to the same foreign competition.

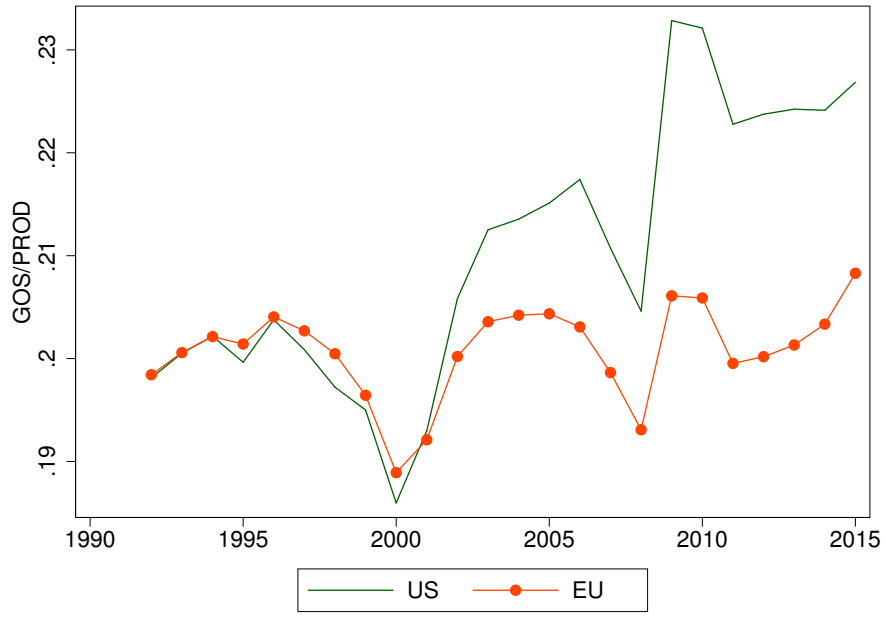
We then propose an explanation for this puzzling evolution. Our explanation has two parts: why initial conditions in Europe and in the US were actually different in a subtle way; and how initial differences became important.

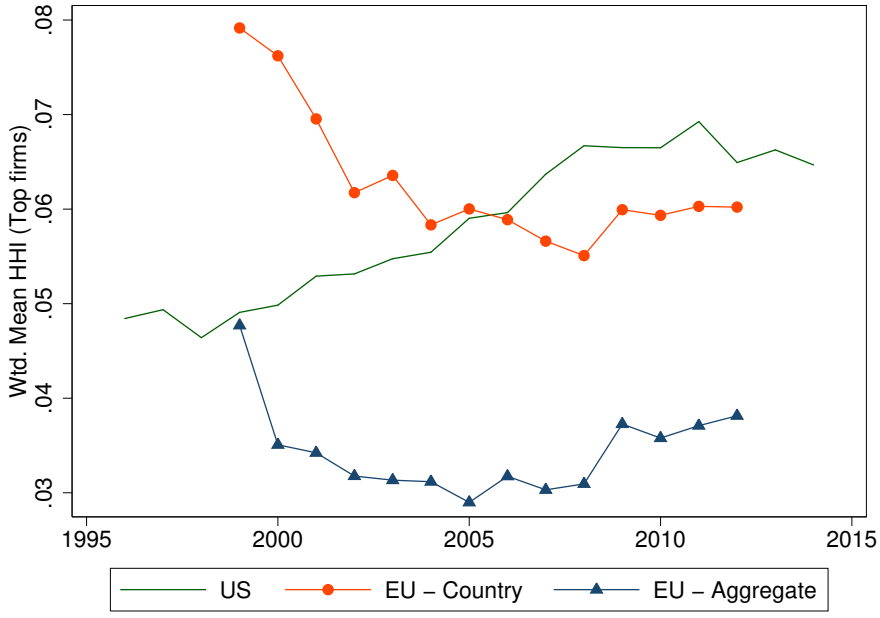
We first argue that, although EU institutions resemble American ones in terms of goals, scope and doctrine, they are often granted more political independence than their American counterparts. This is true of the two leading supranational institutions: the European Central Bank (ECB) is not subject to the same level of parliamentary oversight as the Federal Reserve Board (Fed); and the Directorate-General for Competition (DG Comp) is more independent than the Department of Justice (DoJ) or the Federal Trade Commission (FTC). Faure-Grimaud and Martimort (2007) summarize the prevailing view about EU institutions: "*the European Central Bank remains the most spectacular example of delegation to a new European institution*," but the EU "*has also created a dozen of independent agencies over the last thirty years or so [..] For instance, in the field of merger control, the European Commission was delegated the competence to regulate mergers under the 1989 Merger Control Regulation*."[2]

[1] We plot Compustat-based measures of concentration in order to harmonize segments between the US and Europe. Appendix C shows a variety of robustness tests related to both profit rates and concentration. These include the evolution of individual industries, as well as alternate measures of concentration based on the Census for the US and the ECB's CompNET and EU KLEMS 2008 for Europe. See also Autor et al. (2017) for a longer time-series of US census-based concentration measures under a consistent segmentation. The series in Autor et al. (2017) exhibit similar trends: concentration begins to increase between 1992 and 1997 for Retail Trade and Services, and between 1997 and 2002 for the remaining sectors. Of course, measures of concentration based on industry classification codes differ from those used in actual antitrust cases, because an "industry" is usually much wider than a "market". We discuss the controversy regarding these measures of concentration (Shapiro, 2018) in the next section.

[2] The role of economists within the DG comp has increased during the 2000's, in particular with the creation of the position of Chief Competition Economist in 2003. The position EU commissioner for competition is prestigious, attracts high caliber politicians, and benefits from strong public recognition.

Figure 1: *Profit Rates and Concentration Ratios: US vs. EU*





Note: Annual data. Profit rates for Non-Agriculture Business sector excluding RE, from OECD STAN. EU series based on industry-weighted average across those EU-28 countries for which data are available in STAN. US Herfindahls from Compustat. EU Herfindahls from Amadeus, based on the top 50 firms in each country/industry to mirror the use of public firms in the US. The sample of EU countries is based on Dottling et al. (2017), and therefore includes only Austria, Belgium, Germany, Spain, Finland, France, Great Britain, Italy, Netherlands and Sweden. Red dotted line shows the weighted average of country-industry Herfindahls (i.e., each country is treated as an independent market). Blue dotted line shows the weighted average of industry Herfindahls treating the EU as a single market. To ensure consistency, Herfindahls follow the EU KLEMS segmentation and are averaged across industries using the US-share of sales in each industry and year. See Appendix C for robustness tests, including alternate measures of concentration, segment definitions, country samples and data sources; and Appendix Section D for additional details on the datasets..

This is surprising because it appears to contradict the conventional wisdom about European and American preferences. Do Europeans really believe more in Milton Friedman than Americans? Do they believe more in free markets? We argue that they probably do not, but instead that the equilibrium among sovereign nations leads to supra-national institutions that are more politically independent than what the average politician would choose.

We build a model to clarify this intuition. We consider the design of an anti-trust regulator and we compare compare the degree of independence granted to a supra-national authority versus a national one. Politicians and/or civil servants design the regulator and can make it more or less independent from business and/or political influence. An independent regulator maximizes consumer surplus, while business leaders try to increase profits. The model has an interior solution for the degree of independence that depends on the influence that firms have on politicians at the design stage. Our key result is that this degree of independence is strictly higher when two countries set up a common regulator than when each country has its own regulator. The key insight is that politicians are more worried about the regulator being captured by the other country than they are attracted by the opportunity to capture the regulator themselves. French and German politicians might not like a strong and independent antitrust regulator, but they like even less the idea of the *other* nation exerting political influence over the institution. As a result, if they are to agree on any supra-national institution, it will have a bias towards more independence.

Our model makes three testable predictions:

1. EU countries agree to set up an anti-trust regulator that is tougher and more independent than their old national regulators (and the US)

2. US firms spend more on lobbying US politicians and regulators than EU firms.

3. Countries with weaker ex-ante institutions benefit more from supra-national regulation.

We test these predictions in the remainder of the paper. We first focus on antitrust – merger and non-merger reviews and remedies – because it has clearly become an EU-level competency. Using indicators of competition law and policy from the OECD and Hylton and Deng (2006), we show that DG Comp is more independent and more pro-competition than any of the national regulators, including the US. We show that enforcement has remained stable (or even tightened) in Europe while it has become laxer in the US.

We then study product market regulations, which is usually a shared competency between the member state and the EU (see below for details). Once again, we find that the EU has become relatively more pro-competition than the US over the past 15 years. Product market regulations have decreased in Europe, while they have remained stable or increased in the US.

Moving to political expenditures, we show that US firms spend substantially more on lobbying and campaign contributions, and are far more likely to succeed than European firms/lobbyists.

Last, we show that EU countries with initially weak institutions have experienced large improvements in antitrust and product market regulation. Moreover, we find that the relative improvement is larger for EU countries than for non-EU countries with *similar* initial institutions.

Using data across industries and across countries, we show that these reforms have real effects. We show

that differential enforcement and product market reforms explain (part of) the relative rise of concentration and market power in the US.

Finally, we find no evidence of excessive enforcement in Europe: enforcement leads to lower concentration and profits but we find no evidence of a negative impact on innovation. If anything, (relative) enforcement is associated with *faster* future (relative) productivity growth, although the effects are small.

Literature. Our paper is related to several strands of literature. We discuss key references here, and provide more detailed discussions throughout the paper.

Our paper contributes to the active debate regarding the evolution of concentration, profits and markups in the US. Grullon et al. (2016) show that concentration and profit rates have increased across most US industries. Barkai (2017) is the first paper to document an increase in profits in excess of required returns on capital. Furman (2015) and CEA (2016) argue that the rise in concentration suggests "economic rents and barriers to competition." Autor et al. (2017) show that the increase in concentration is linked to the decrease in the labor share. Shapiro (2018) and Werden and Froeb (2018) criticize the use of concentration measures based on SIC or NAICS. Gutiérrez and Philippon (2017a) link the decline in competition to the decrease in corporate investment. Gutiérrez and Philippon (2018) study the role of governance and its interaction with concentration. Alexander and Eberly (2016) and Crouzet and Eberly (2018) argue that the rise in intangible investment can account, in some industries (e.g. retail trade) for the rise in concentration and the decrease in measured investment. De-Loecker and Eeckhout (2017) and Hall (2018) argue that markups of prices over marginal costs have increased in the US. Our paper is the first to document the evolution of concentration in Europe and to compare it with the US. In addition, the existing literature mostly documents the increase in concentration and profit without providing or testing different explanations. By comparing the evolution of the US and Europe, we show the importance of antitrust policy and regulations.

Our paper also contributes to the lively debate regarding antitrust enforcement and the role of regulation in the US. Kwoka (2015) criticizes the weakening on merger reviews in the US over the past 20 years. Vita and Osinski (2016) offer a rebuttal while Kwoka (2017a) maintains the validity of the original critique. Bergman et al. (2010) find that the EU has been tougher than the US in its review of dominance mergers – at least up to 2004. Regarding regulation, Bailey and Thomas (2015) find a negative and significant relationship between regulation and measures of business dynamism. Davis (2017) argues that barriers to entry have risen due to excessively complex regulations. By contrast, Goldschlag and Tabarrok (2018) find a positive but insignificant relationship. We are the first to provide a systematic comparison between Europe and the US. This comparison is particularly useful since, in most industries, technology is similar in the two regions. This allows us to show the impact of policy decisions.

Our paper also contributes to the literature on the political economy of commitment and institutions. A classic idea from monetary economics is that rules dominate discretion when optimal policies are time-inconsistent (Kydland and Prescott, 1977; Calvo, 1978). Reputation can sustain some rules (Barro and Gordon, 1983) but external commitments can be necessary, such as appointing conservative policy makers (Rogoff, 1985) or implementing a currency board or a monetary union. We argue that the idea of external commitment is also relevant in the context of anti-trust. Faure-Grimaud and Martimort (2003) and Faure-Grimaud and Martimort

(2007) analyze the issue of regulatory independence. They argue that regulatory independence can insulate policies from political cycles, but can increase the scope for regulatory capture. Rajan and Zingales (2003) emphasize the role of free financial markets in maintaining a level playing field for competition and innovation. More broadly, our paper sheds light the economic analysis of institutions, pioneered by North (1990) and discussed by Acemoglu et al. (2005). We show how effective enforcement and regulations can drift over time even in the absence of explicit institutional change.

Finally, our paper relates to the political economy of European integration (Alesina and Giavazzi, 2006). It is useful to cast the discussion of antitrust in Europe in the broader context of economic integration and the Single Market. Why did European economic integration happen so quickly in the 1980s and 1990s? The answer is far from obvious. The single market was not the by-product of some inevitable process of globalization. An astute observer in 1980 could not easily have predicted the rapid emergence of the Single Market. Instead, Jabko (2012) argues that the European Commission played to its advantage the idea of the 'market' in order to promote European integration. Jabko's demonstration relies on four detailed case studies: the integration of financial markets, the deregulation of the energy market, structural policies (such as development policies for new member states), and the European Monetary Union (EMU). In all these cases, Jabko argues that the Commission used the idea of the market to promote its agenda of European integration. This idea, however, meant different things to different people. Depending on the audience, it was possible to emphasize the free-market component, the common regulation, or the protection from the economic giants of Asia and America.

The remainder of this paper is organized as follows. Section 1 further documents the evolution of concentration and profitability in the US and Europe. Section 2 presents our model of regulatory independence, which yields three predictions tested in Sections 3 to 5. Section 6 studies the real effects of enforcement and regulation; and Section 7 concludes.

1 Stylized Facts: EU vs US

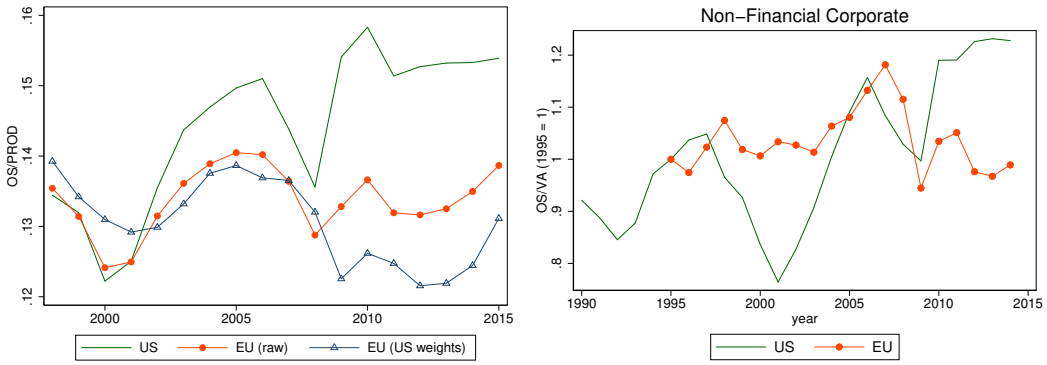
In this Section we provide more detailed evidence consistent with Figure 1 on the divergence in concentration and profits between the US and the EU.

1.1 Profits

Figure 1 above shows that gross profit rates ($GOS/PROD$) have increased in the US yet have remained stable in Europe. While the differences are striking, part of the gap across regions may be due to variations in industry mix, variable definitions (e.g., treatment of depreciation) or firm types (e.g., corporate vs. non-corporate). Figure 2 shows this is not the case. We obtain similar conclusions using net profit rates ($OS/PROD$) and adjusting for the US-industry mix (left), or focusing on the Non-Financial Corporate (NFC) sector and studying profit rates with respect to value added (right).

Moving from simple profit ratios to the profit and labor share, Gutiérrez (2017) shows that the decline in the EU labor share is fully explained by Real Estate. Excluding Real Estate, the EU labor share has remained relatively stable since the 1970s (it first rose in the 1970s and then declined to 2007, but has since

Figure 2: *Profit Margins*



Notes : Annual data. Left panel covers Non-Agriculture Business sector excluding RE, using data from OECD STAN. EU series based on weighted average across those EU-28 countries for which data are available in STAN. Red dotted line uses the EU share of sales directly. Blue line with triangles weighted based on the US-share of sales in each industry and year to control for differences in industry mix across regions. Right panel covers NFC sector, using data from FRED for US and the OECD for the EU (except Spain and Italy for which we gather data directly from National Accounts).

recovered above its 1970's level). By contrast, the US labor share experienced a sharp decline, particularly after 2000. Similarly, profit shares in the style of Barkai (2017) remained relatively stable for all countries except the US, where they increased drastically (from ∼10% of value added in 1988 to more than 20% in 2015). The rise in profits and decline in labor share is pervasive across US industries; compared to mixed labor and profit share patterns in other countries. The behavior of corporate investment relative to Tobin's Q is also consistent with our interpretation of the evolution of competition in the US and in Europe. In Gutiérrez and Philippon (2017b), we discuss in details the evolution of investment in the US, and in Dottling et al. (2017) we compare the EU and the US. We show that the large and persistent gap between investment and Q only exists in the US. We summarize these findings in Appendix C.

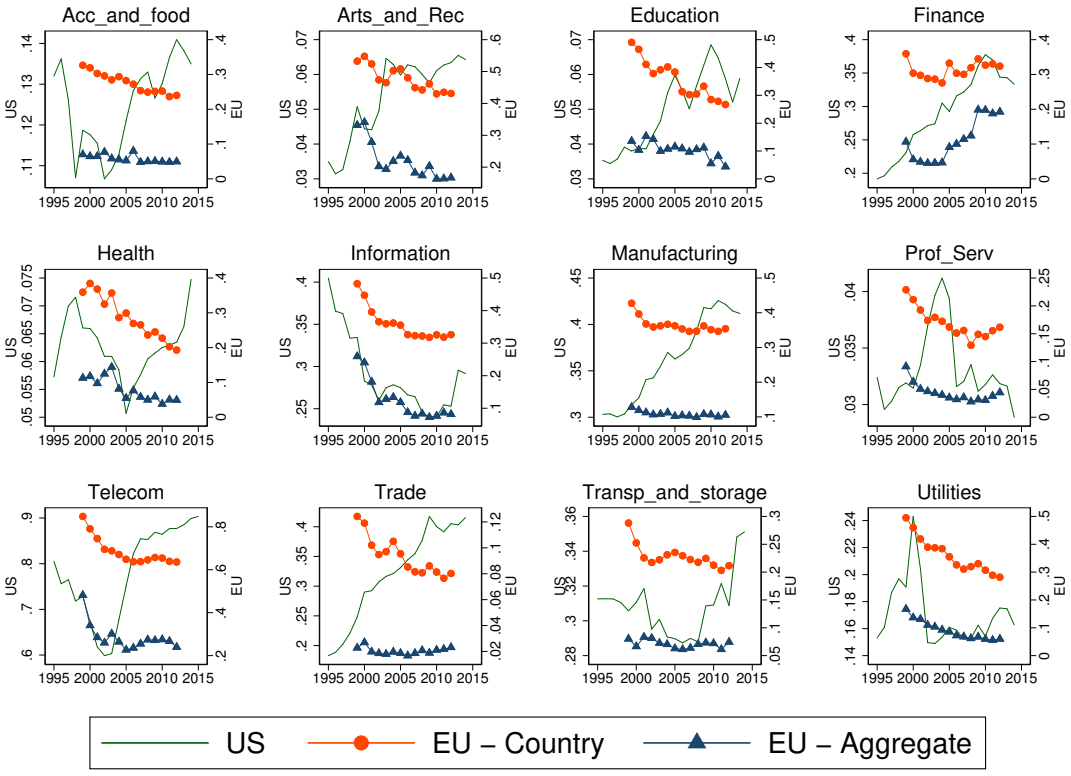
1.2 Selected Industries

The above results cover all sectors, and may therefore obscure dynamics at a more granular level. For instance, it may be that US trends are driven by particular industries, such as High Tech, which have experienced technological changes and benefit from winner-take-all effects. However, this is not the case. Figure 3 shows that the rise in US concentration since 2000 is pervasive across most sectors, just as the stability/decline in EU concentration. As before, we plot EU series treating each country as a separate market and the EU as a single market. In fact, concentration in the information sector (which contains Google, Microsoft and Facebook) decreased since the late 1990s in both the US and Europe (although it increased slightly in recent years in the US). Appendix C presents a variety of robustness tests.

Figure 4 focuses on the industries that have experienced the fastest concentration in the US. It compares the weighted average (domestic) Herfindahl, investment rate, operating margin and Q for the 5 industries that concentrate the most in the US.[3] The series are aggregated across industries based on the US share of sales,

[3]We exclude the Manufacturing - Textiles industry even though it exhibits a rise in domestic concentration because the increase is primarily due to foreign competition. Accounting for imports, the Herfindahl increased much less than for the remaining 5

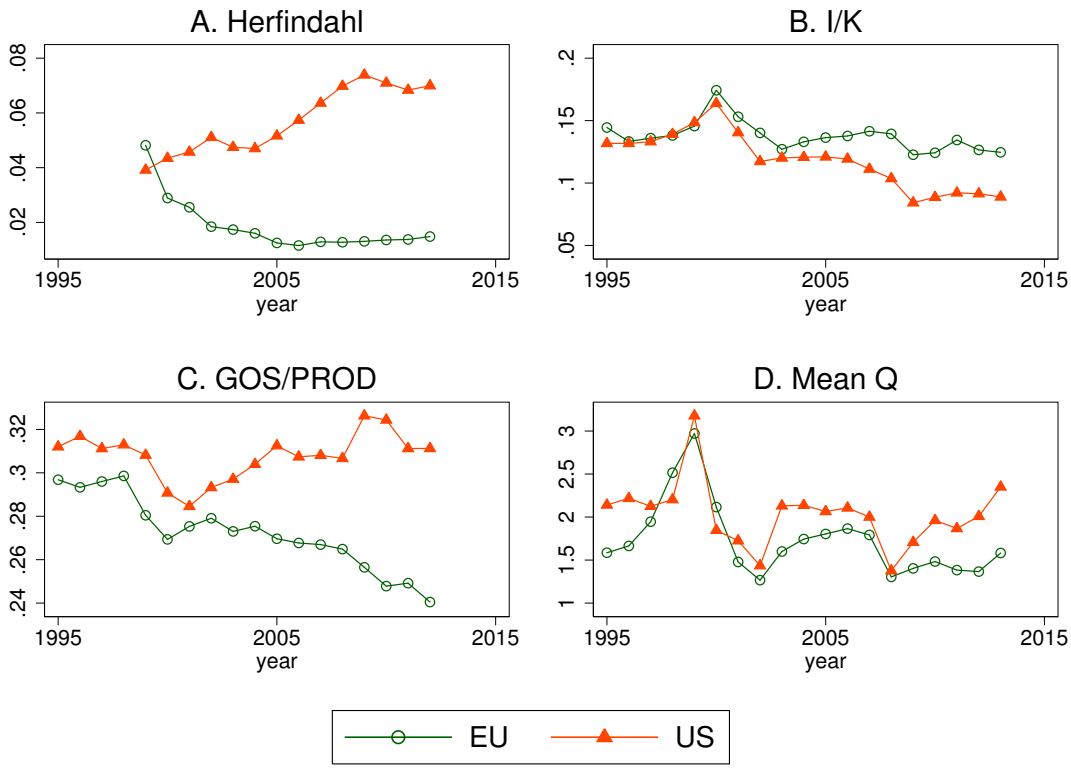
Figure 3: *Mean 8-firm CR by Sector: EU vs US*



Note: Annual data. US Herfindahls and Concentration ratios from Compustat adjusted for the Compustat share of sales. EU Concentration Ratios and Herfindahls from Amadeus. The sample of EU countries is based on Dottling et al. (2017), and therefore includes only Austria, Belgium, Germany, Spain, Finland, France, Great Britain, Italy, Netherlands and Sweden. Red dotted line shows the average of country-industry concentration measures across Europe, within each sector (i.e., each country is treated as an independent market). Blue dotted line shows the average of industry concentration measures within each sector, treating the EU as a single market. Industries follow the EU KLEMS segmentation outlined in Appendix D. Google, Microsoft and Facebook are all contained in Information, Amazon in Trade and Apple in Manufacturing

capital, output and assets (respectively) to ensure a common weighting across regions. Concentration, profits and Q increased in the US, while investment decreased. By contrast, concentration decreased in Europe, and investment remained (relatively) stable despite lower profits and lower Q. This true even though these industries use the same technology and are exposed to the same foreign competition.

Figure 4: *Comparison with EU for Top 5 Concentrating Industries in US*



Notes: this figure is replicated from Gutiérrez and Philippon (2017a). It is based on the top 5 concentrating industries in the US: Information Telecom, Arts and Recreation, Wholesale and Retail trade, Other Services and Information Publishing (which includes software). Panel A plots the weighted average Herfindahl across these industries, weighted by sale. For the EU, each industry's Herfindahl is the weighted average Herfindahl across countries. Panel B plots the weighted average investment rate, weighted by the capital stock. Panel C plots the the weighted average ratio of Gross Operating Surplus to Production. Last, Panel D plots the weighted average mean Q, by assets. All weights are based on the US share of industries to control for differences in industry sizes across regions.

Studying the underlying industries, we find broadly consistent results. Take Telecom, for example. Appendix Figure 24 shows that concentration increased and investment decreased in the US, while both series remained stable in Europe. Consistent with the rise in market power, Table 1 shows that broadband prices in the US are substantially higher than those of other advanced economies.

Figure 5 confirms the same fact using an alternate source: the OECDs broadband price indices. Moreover, in line with our emphasis on Antitrust and regulation, Figure 5 shows that countries which implemented

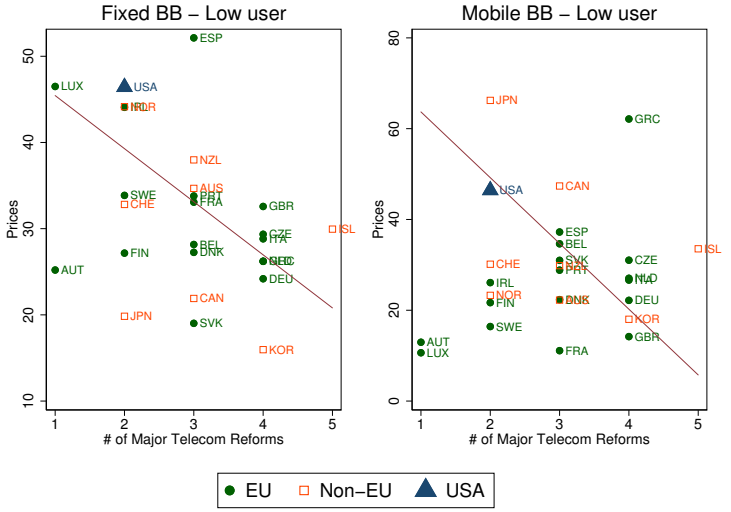
concentrating industries.

Table 1: *Broadband Prices, Selected Countries*

Rank	Country	Average Monthly Cost
37	South Korea	$ 29.9
47	Germany	$ 35.71
54	France	$ 38.10
...		
113	US	$ 66.17

Source: Cable.Co.UK

Figure 5: *Telecom Prices vs. Reforms*



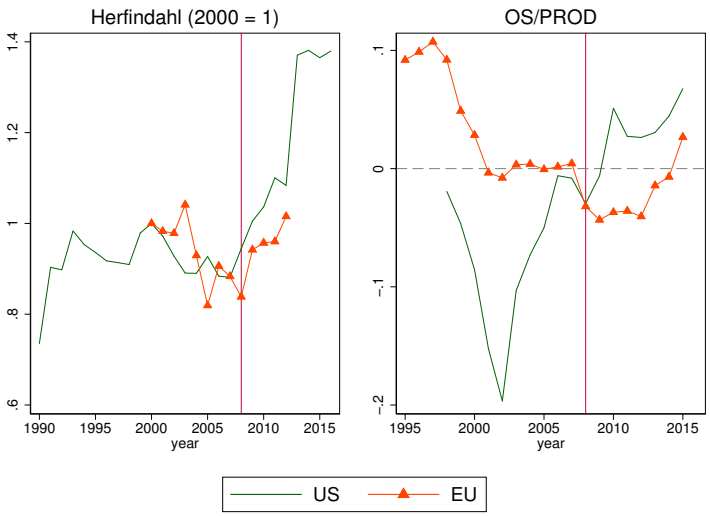
Notes: OECD fixed and mobile broadband price indices for 2017, available at link. Number of major Telecom reforms from Duval et al. (2018). Broadly similar results for high broadband plans users, or adjusting for PPP. Fitted line weighted by country GDP.

more major product market reforms in the Telecom sector since 1970 exhibit lower prices in both fixed and mobile broadband. This is consistent with Faccio and Zingales (2017), who argue that pro-competition regulation reduces prices but does not hurt quality of services or investments. In fact, they estimate that US consumers would gain $65bn a year if US mobile service prices were in line with German ones.

Similarly, Figure 6 shows that both concentration and profits increased in the US Airlines industry, while they remained stable or decreased in Europe. In fact, the rise in US concentration and profits closely aligns with a controversial merger wave that includes Delta-Northwest (2008, noted by the vertical line), United-Continental (2010), Southwest-AirTran (2011) and American-US Airways (2014).[4]

[4]See The Economist's article, "A lack of competition explains the flaws in American aviation" (April 2017) for related observations.

Figure 6: *EU vs US: Airlines*



Notes: Chart compares the evolution of the Herfindahl and gross profit rate in the Transportation - Air industry for the US and Europe. Concentration series from Compustat (US) and CompNET (EU). Profit rate series from OECD STAN.

2 Model

There are two goods, two periods, and either one or two countries. We interpret the first period as the 1980's and 1990's, when EU institutions are designed, and we interpret the second period as the 2000's when we observe the evolution of the US relative to Europe.

Table 2: *Timing and Preferences of the Model*

	First Period (1990's)	Second Period (2000's)
Politician	$W = \mathbb{E}\left[(1-\beta)U + \beta V_\epsilon\right]$	.
Politician	.	$V_\epsilon = U + \gamma \Pi_\epsilon, \epsilon \in (1,2)$
Regulator	θ is set	$\mathcal{R} = \max (1-\theta) U + \theta V_\epsilon$

2.1 One country

We solve the model by backward induction, so we start with the second period, when the regulator is in place.

Technology and Preferences The economy produces and consumes two goods indexed by $i \in \{1,2\}$. Let x denote consumption and n denote labor. Households' preferences are given by $U \equiv \sum_{i=1}^{2} u(x_i) - n$, where we assume that u is strictly increasing and strictly concave. For simplicity, we consider the case of log-preferences: $u \equiv \log$ and linear technologies. The general case is presented in the Appendix. The technology has constant returns and uses only labor with productivity z: $x_i = z_i n_i$. We discuss fixed costs

and decreasing returns in the extensions. Labor market clearing requires $n = \sum_{i=1}^{2} n_i$. Given prices and wages, household maximize

$$U = \max \sum_{i=1}^{2} \log(x_i) - n$$
$$s.t. \sum_{i=1}^{2} p_i x_i = wn + \sum_{i=1}^{2} \Pi_i^{\$}$$

where $\Pi_i^{\$}$ are (nominal) profits from industry i. Let λ be the Lagrange multiplier on the budget constraint. We have $u'(x_i) = \lambda p_i$ and $1 = \lambda w$ which, with log-preferences, implies the demand curve

$$x_i = \frac{w}{p_i}. \tag{1}$$

Regulated Monopolies Let us now consider the market equilibrium under regulation. Firms' profits are given by $\Pi_i = p_i x_i - w\frac{x_i}{z_i}$. To capture in a simple way the main effects of regulation in the goods markets, we assume that the regulator sets an upper bound μ on the markup that firms can charge, i.e., firms in industry i cannot set a markup higher than μ_i. In equilibrium firms will choose the maximum allowable price

$$p_i = \frac{1+\mu_i}{z_i} w \tag{2}$$

Using equations (1) and (2), we then get the equilibrium output

$$x_i = \frac{z_i}{1+\mu_i}$$

So there is simple direct mapping between the markups and the quantities produced in equilibrium. We can therefore think of the regulator as indirectly choosing the quantities $\{x_i\}_{i=1,2}$, with implied markup $\mu_i = \frac{z_i}{x_i} - 1$ This leads to the indirect utility function for the households

$$U(\{x_i\}_i) = \sum_{i=1}^{2} \log(x_i) - \frac{x_i}{z_i}.$$

Nominal profits can be written as a function of markups or quantities $\Pi_i^{\$} = w\mu_i \frac{x_i}{z_i} = w\frac{\mu_i}{1+\mu_i} = w\left(1 - \frac{x_i}{z_i}\right)$. We define real profits as $\Pi_i = \Pi_i^{\$}/w$ and therefore

$$\Pi_i = 1 - \frac{x_i}{z_i}$$

Note that $\frac{\partial \pi}{\partial x_i} < 0$ and that the consumer welfare maximizing level is $x_i^* = z_i$, which corresponds to $\mu_i = 0$ and $\Pi_i = 0$. The first best utility level is

$$U^* = \sum_{i=1}^{2} \log(z_i) - 2.$$

Welfare and Capture Ex-Post Firms seek to influence politicians and regulators in order to increase their market power. Specifically, firms lobby politicians who in turn may or may not be able to influence regulators. As in the political support literature, we assume that politicians' utility is a mixture of social welfare and corporate profits, and we consider random regulatory capture by one of the two industries

$$V(\epsilon) = U + \gamma \Pi_\epsilon,$$

where $\epsilon = 1, 2$ with equal probability. Our specification of the utility function is similar to the one in Grossman and Helpman (1994). The main difference is that we assume that regulations are enforced by regulators, and only indirectly influenced by politicians, to the extent that regulators are not fully independent.

Regulators maximize a weighted average of consumers welfare U and politicians' utility V

$$\mathcal{R} = \max_{\{\mu_i\}} (1-\theta) U + \theta V(\epsilon) \tag{3}$$

The parameter θ captures the degree of influence of politicians over regulators, which we take as given for now, and endogenize in the next section. The point of our model is to understand the forces that determine θ and how they change when we consider a supra-national regulator. For simplicity, but with a slight abuse of notations, we write $x_{i=\epsilon} \equiv x_i(\epsilon = i)$ and $x_{i\neq\epsilon} \equiv x_i(\epsilon \neq i)$. We measure the deviation from ex-post consumer surplus maximization by the variable m defined as the ration of output to efficient output:

$$m_i \equiv \frac{x_i}{x_i^*},$$

and recall that with constant returns and log-preferences we simply have $x_i^* = z_i$. We will use $\bar{m}$ to denote the equilibrium with one country and m^s to denote the equilibrium with a supra-national regulator. We have the following Lemma.

Lemma 1. *With one national regulator, one industry is competitive: $x_{i\neq\epsilon} = z_i$ and $\Pi_{i\neq\epsilon} = 0$; while the other industry charges a markup $\gamma\theta$: $x_{i=\epsilon} = \bar{m} z_i$ and $\Pi_{i=\epsilon} = 1 - \bar{m}$ where $\bar{m} \equiv \frac{1}{1+\gamma\theta}$. The ex-post utility does not depend on the realization of ϵ:*

$$U(\theta) = U^* + \log(\bar{m}) + 1 - \bar{m}.$$

Proof. The program of the regulator is equivalent to

$$\max_{\{x_i\}} U(\{x_i\}_i) + \theta\gamma\Pi_\epsilon$$

We can write the objective function as

$$\sum_{i=1}^{2} \log(x_i) - \frac{x_i}{z_i} + 1_{\epsilon=i}\theta\gamma\left(1 - \frac{x_i}{z_i}\right)$$

The solution is $x_{\epsilon\neq i} = z_i$ and $x_{\epsilon=i} = \frac{z_i}{1+\gamma\theta}$, so $\bar{m} = \frac{1}{1+\gamma\theta}$. □

Note that, with log-preferences, ex-post consumer welfare does not actually depend on whether $\epsilon = 1$ or $\epsilon = 2$.

Ex-Ante Design of Regulatory Independence The first period corresponds to the design of institutions. To be concrete, in the case of Europe, we think of politicians and civil servants setting up the framework for EU antitrust policy in the 1990's. The utility of the politicians building the regulatory framework is

$$W = \mathbb{E}\left[(1-\beta)\, U + \beta V_\epsilon\right]$$

The founding fathers choose θ to maximize W.

Lemma 2. *In a closed economy (one country), the politicians choose a regulatory framework with influence parameter*

$$\theta = \beta$$

There are several ways to interpret the parameter β. In the equations above, β captures the bias in the preferences of the politicians designing the institutions. We choose this setup because it is the most parsimonious. A benevolent planner would create fully independent institutions charged strictly with maximizing consumer surplus. In reality, there are legitimate reasons to deviate from strict consumer surplus maximization ex-post: externalities, entry costs, innovations, etc. In Lim and Yurukoglu (2018), for instance, there is an optimal ex-post return on capital that encourages efficient investment ex-ante. The appendix presents a simple model where a benevolent planner chooses θ, taking into account externalities.

Perhaps more importantly, there are significant ideological differences among politicians. Lim and Yurukoglu (2018) find that "conservative regulators [within the US] mitigate welfare losses due to time inconsistency, but worsen losses from moral hazard." There are also persistent differences across countries. In France, there is a long tradition of "Colbertisme", which argues for state intervention in the economy and for industrial policy aimed at protecting firms from excessive competition. Historically, the UK, and later the US, have championed a more free-market approach, and have been suspicious of politicians exerting direct influence on business decisions. These stereotypes are somewhat simplistic but they capture material differences in how countries operate. We can thus also think of France or Italy as being high β countries for ideological reasons.

Throughout our discussion, we think of institutional design and independence as encompassing a broader set of issues than capture of antitrust agencies. Institutional design includes the entire enforcement process, from the antitrust agencies to the courts. A highly independent agency that is unable to win cases in courts would be unable to constrain mark-ups.

We now turn to our main task: to understand how the design of a supra-national regulator differs from that of national ones.

2.2 Supra-National Regulatory Design

We extend our model to two countries and we assume that production is specialized. Country j produces good j. We assume that the law of one price holds, so that the price of good i is the same in both countries.

Let $x_{i,j}$ denote the consumption of good i by country j. Consumer welfare in country j is given by

$$U_j = \sum_{i=1}^{2} \log(x_{i,j}) - n_j.$$

The demand for goods is similar to equation (1) except that wages might differ across countries: $x_{i,j} = \frac{w_j}{p_i}$. Balanced trade requires

$$p_1 x_{1,2} = p_2 x_{2,1}$$

This implies $w_1 = w_2$.[5] Given that wages and prices are equalized, so are the quantities consumed for each good: $x_{i,i} = x_{i,j} \equiv x_i$. Since $p_i = (1+\mu_i) w_i / z_i$, we still have $x_i = \frac{z_i}{1+\mu_i}$. Market clearing requires $z_i n_i = x_{i,i} + x_{i,j} = 2x_i$, so in equilibrium, we have

$$U_i = \log(x_i) + \log(x_j) - \frac{2x_i}{z_i} \tag{4}$$

and profits are

$$\Pi_i = 2\left(1 - \frac{x_i}{z_i}\right)$$

Ex-Post Regulatory Capture Politicians care about domestic welfare and the profits from domestic industries. Politicians from country i have utility $V_i = U_i + \gamma \Pi_i$. Politicians from each country attempt to influence the common regulator and are equally likely to succeed. The supranational regulator therefore maximizes $(1-\theta)(U_1 + U_2) + \theta V_\epsilon$, which we can also write as

$$\mathcal{R}^s = \max U_{\epsilon=i} + (1-\theta) U_{\epsilon \neq i} + \theta\gamma \Pi_{\epsilon=i}.$$

Using (4), the objective function becomes $(2-\theta)\log(x_{i=\epsilon}) + (2-\theta)\log(x_{j\neq\epsilon}) - (1+\theta\gamma)\frac{2x_{i=\epsilon}}{z_i} - (1-\theta)\frac{2x_{j\neq\epsilon}}{z_j} + 2\theta\gamma$. Let "$s$" to denote the equilibrium with a supranational regulator. The solution is

$$\frac{x_{\epsilon=i}}{z_i} = m^s(\theta;\gamma) \equiv \frac{1-\frac{\theta}{2}}{1+\theta\gamma} < \bar{m}_\theta,$$
$$\frac{x_{\epsilon\neq i}}{z_i} = M^s(\theta;\gamma) \equiv \frac{1-\frac{\theta}{2}}{1-\theta} > 1.$$

The allocation is distorted in two ways compared to the one country model. First, politicians perceive a different trade-off between profits and welfare because some of the higher prices are paid by foreign households. This explains why $m^s_\theta < \bar{m}_\theta$. Second, they impose lower markups to foreign producers in order to benefit domestic households.[6] This explains why $M^s_\theta > 1$. This corresponds to a form of "regulatory

[5] This is the simplification brought by assuming log preferences. When the demand elasticity is not one, then the relative wage will in general differ from one. This does not change our main results but it complicates the exposition.

[6] With linear technologies this implies negative operating profits. It is easy to extend the model to include decreasing returns and fixed entry costs. In that case operating profits would be still positive, as shown in the Appendix.

overreach", as emphasized by the Chicago school. The ex-post utilities are

$$U_{\epsilon=i} = U^* + \log\left(m_\theta^s\right) + \log\left(M_\theta^s\right) + 2\left(1 - m_\theta^s\right)$$
$$U_{\epsilon\neq i} = U^* + \log\left(m_\theta^s\right) + \log\left(M_\theta^s\right) + 2\left(1 - M_\theta^s\right)$$

Ex-Ante Design of Regulatory Independence Let us consider the choice of θ at the design stage. The ex-ante utility of policy designers from country i is

$$\begin{aligned} W^s(\theta) = \mathbb{E}\left[(1-\beta)U_i + \beta V_i\right] &= \mathbb{E}\left[U_i + \beta\gamma\Pi_i\right] \\ &= U^* + \log\left(m_\theta^s\right) + \log\left(M_\theta^s\right) + (1+\beta\gamma)\left(2 - m_\theta^s - M_\theta^s\right) \end{aligned}$$

This new program differs from the one country program in two ways. First, $m^s(\theta)$ implies a different mapping than $\bar{m}(\theta)$. This means that, even if we ignored M_θ^s, implementing the preferred markup $\gamma\beta$ would require a lower value of θ.[7] Second, increasing θ lowers m but it increases M. This implies more independence and lower average markups. The following proposition summarizes our results.

Proposition 1. *Politicians choose a higher degree of independence for a supra-national regulator than for a national one:*

$$\theta^s \in (0, \beta).$$

As long as $M'(\theta) > 0$, the equilibrium also implies more competitive markets: $m^s(\theta^s) > \bar{m}(\beta)$.

Proof. M is a strictly increasing function of θ while m is decreasing in θ. The objective function is

$$W^s(\theta) - U^* = \log(m) + \log(M) + (1+\beta\gamma)(2 - m - M)$$

The derivative is

$$\begin{aligned} \frac{\partial W^s}{\partial\theta} &= \frac{m'}{m} + \frac{M'}{M} - (1+\beta\gamma)\left(m' + M'\right) \\ &= -m'\left(1 + \beta\gamma + \left(1 + \beta\gamma - \frac{1}{M}\right)\frac{M'}{m'} - \frac{1}{m}\right) \end{aligned}$$

Therefore the solution is

$$\frac{1}{m} = 1 + \beta\gamma + \frac{M'}{m'}\left(1 + \beta\gamma - \frac{1}{M}\right)$$

Since $M > 1$ and $m' < 0$ we have $\frac{M'}{m'}\left(1 + \beta\gamma - \frac{1}{M}\right) < 0$ and therefore m is larger than $(1+\beta\gamma)^{-1}$. This proves $m^s(\theta^s) > \bar{m}(\beta)$ if and only if $M' > 0$. Since $m^s < \bar{m}$ for all θ, this also proves $\theta^s < \beta$. Next we need to show that $\theta^s > 0$. When $\theta = 0$ and $m = M = 1$, we have $\frac{\partial M}{\partial\theta} = \frac{1}{2}$; $\frac{\partial m}{\partial\theta} = -\frac{1}{2} - \gamma$ therefore

$$\frac{M'}{m'}(0) = -\frac{1}{1+2\gamma}$$

[7] To achieve a markup of $\gamma\beta$, i.e., to get the quantity $m = \frac{1}{1+\beta\gamma}$, the designer would need to set $\theta = \frac{\beta\gamma}{\gamma + \frac{1+\beta\gamma}{2}}$.

Thus

$$1+\beta\gamma+\beta\gamma\frac{M'}{m'}(0)=1+\beta\gamma\frac{\gamma}{\gamma+1/2}>1$$

and therefore

$$\frac{\partial W}{\partial\theta}(0)>0$$

Starting from $\theta=0$, a marginal increase in markups raises the ex-ante value function of politicians. This proves $\theta^s>0$. QED. □

Proposition 1 contains the first prediction of our theory. Our model predicts that there should be a clear difference between national regulators and a supra-national antitrust regulator. The supra-national regulator should not reflect the average of countries' preference, but instead, we should observe a discrete increase in independence. The model explains why this is the case.

The key insight comes from comparing national and supra-national regulatory capture. The capture of a joint regulator leads to larger welfare losses because national politicians do not care about the citizens of other countries. As a result, it is efficient to commit ex-ante to a more independent regulator. This, in our view, explains why DG Comp is structurally more insulated from political and lobbying pressures than the DoJ or the FTC.[8]

The Appendix presents an analysis of the model with more general functional forms. With linear disutility of labor and linear technology, agents are de-facto risk neutral because they can fully smooth consumption by adjusting labor supply. The Appendix derives the solution under decreasing returns. In that case, there is an additional argument for independence of the supra-national regulator, because politicians are more worried about the regulator being captured by the other country than they are attracted by the opportunity to capture the regulator themselves. In other words, capture is risky, and independence reduces risk.

2.3 Extensions

We now extend the basic model to obtain other predictions regarding lobbying and ex-ante heterogeneity across countries. It is straightforward to extend our analysis to the case of N countries. We show in the Appendix that regulatory independence increases with N and converges to a finite value as N becomes large.

Lobbying Introducing lobbying is important for two reasons: it allows us to make a clear, testable prediction; and it provides a more plausible interpretation of current EU's antitrust as being partly a forward fumble.

Suppose firms hire l lobbyists in order to influence regulators and politicians. Notice that l are real resources spend on lobbying.[9] We assume that the influence of lobbyists is measured by the function $\Gamma(l;\theta)$,

[8] Interestingly, this does not imply a complete lack of democratic accountability as evidenced by the evolution of DG Comp from an entirely independent organization to an increasingly democratic one following the 2004 reforms (First and Weber Waller, 2013).

[9] Official lobbying and corruption are clearly different, both legally and empirically, but that distinction does not really matter

increasing in both arguments and super modular. Equation (3) then becomes

$$\mathcal{R} = \max_{\{x\}} U(x) + \Gamma(l;\theta)\,\Pi$$

We know that this leads to to $m \equiv \frac{1}{1+\Gamma}$ and $\Pi = \frac{\Gamma}{1+\Gamma} w$ (for simplicity we consider here the one-country model, but it will be obvious how the same results apply to several countries). Firms maximize profits net of lobbying expenses $\Pi_i^{\$} = p_i x_i - w\frac{x_i}{z_i} - wl$. This is equivalent to

$$\max_{\{l\}} \frac{\Gamma(l;\theta)}{1+\Gamma(l;\theta)} - l$$

From the super-modularity of $\Gamma(l;\theta)$, it is clear that the solution $l(\theta)$ is an increasing function. We then have the following proposition.

Proposition 2. *In countries with more independent regulators, firms spend less on lobbying.*

A simple functional form is $\Gamma(l;\theta) = \frac{\sqrt{\gamma l\theta}}{1-\sqrt{\gamma l\theta}}$. In that case $\frac{\Gamma(l;\theta)}{1+\Gamma(l;\theta)} = \sqrt{\gamma l\theta}$ and therefore $l(\theta) = \frac{\gamma\theta}{4}$ and, in equilibrium, $\Gamma(\theta) = \frac{\gamma\theta}{2-\gamma\theta}$, which is a simple renormalization of the formula that we have used so far.

Lobbying Uncertainty and the European Forward Fumble. It is important to understand that the designers do not care about θ per-se. In our benchmark model, they choose a degree of competition, i.e., a markup and its associated deviation from ex-post consumer surplus, which we defined above as $m = x/x^*$, and then they back out the value of θ that is consistent with achieving this target. According to this view, the current divergence between US and EU antitrust and regulatory enforcement was predicted by the designers of EU institutions.

There is, however, an equally plausible interpretation where at least some of what we observe today are *unintended* consequences. As argued earlier, EU integration pushes EU politicians to set up independent regulators. They choose a lower θ than in the US. This is their *intended* effect. They do not, however, intend to make EU markets more competitive than US markets. In the 2000s, however, there is an unanticipated shock to the parameter γ, perhaps because political campaigns become more expensive, which makes corporate donations more valuable; or perhaps because globalization increases profits relative to lobbying costs. This shock then has a larger effect in the US than in Europe, and Europe ends up with more competitive markets than the US. In order to see this in the model, we can compare the increase in markups from positive shock to γ in the one country model vs the supranational model:

$$\bar{\mu}(\gamma) = \gamma\beta \rightarrow \frac{\partial\bar{\mu}(\gamma)}{\partial\gamma} = \beta \qquad \text{One-country}$$

$$\mu^s(\gamma) = \frac{\theta^s/2 + \theta^s\gamma}{1-\theta^s/2} \rightarrow \frac{\partial\mu^s(\gamma)}{\partial\gamma} = \frac{\theta^s}{1-\theta^s/2} \qquad \text{Supranational}$$

in our model. One can think of l as the number of lawyers and consultant hired, as campaign contributions, or as bribes. In our empirical analysis, however, we will measure "legal" lobbying.

Lemma 3. *An unexpected increase in γ in period 2 generates a larger increase in markups in the one country model than in the model with a supranational regulator:*

$$\beta > \frac{\theta^s}{1-\theta^s/2}$$

Proof. From proposition 1, we know that markups are higher in the one country model: $\beta\gamma > \frac{\theta^s/2+\theta^s\gamma}{1-\theta^s/2}$. Then, we have:

$$\beta\gamma > \frac{\theta^s/2+\theta^s\gamma}{1-\theta^s/2} > \frac{\theta^s\gamma}{1-\theta^s/2}$$

Dividing by γ, we get $\beta > \frac{\theta^s}{1-\theta^s/2}$. □

Since markups under the supranational regulator were lower to begin with, an unexpected increase of γ in the 2000's would have made Europe more competitive than the US.

Ex-Ante Asymmetric Countries So far we have considered equilibria with ex-ante identical countries. Some of our empirical tests relate to ex-ante heterogeneity. For instance, we show that EU countries with weaker ex-ante institutions benefit more from tough supra-national regulation.

Consider two countries with $\beta_1 < \beta_2$. Country 2 therefore has more biased politicians, more captured regulators, and weaker competition. We know that

$$W_i^s(\theta) - U^* = \log(m^s(\theta)) + \log(M^s(\theta)) + (1+\beta_i\gamma)(2 - m^s(\theta) - M^s(\theta))$$

Assuming equal bargaining power at the design stage (we discuss outside options below), we solve

$$\max_\theta \sum_{i=1}^{2} W_i^s(\theta)$$

The first order condition is

$$\frac{m'}{m} + \frac{M'}{M} - \left(1 + \frac{\beta_1+\beta_2}{2}\gamma\right)(m' + M')$$

We then have the following straightforward proposition.

Proposition 3. *Countries with weaker ex-ante institutions benefit more from supra-national regulation.*

Countries with low initial β benefit less, but because the average β goes down, they still benefit as long as the distribution of β's is not too wide. Also notice that we have taken the weighted average approach to the design. In reality, there are at least two reasons to expect low β countries to have more sway. One is that the EU Commission explicitly promotes best practice. The other is similar to the twin sister argument for the ECB vis a vis the Bundesbank in the context of monetary policy (Debrun, 2001).

Endogenous Common Market So far we have taken as given the existence of a common regulator. But would politicians actually choose to set up a common regulator, or would they prefer to retain their national

sovereignty? This is a complicated issue because the design of the regulator took place in the context of the single market.

Let us consider what the equilibrium would be without joint supervision. The regulator in country i, subject to influence from politicians from country i, would solve

$$\max_{x_i} U_i + \theta_i \gamma \Pi_i = \log(x_i) + \log(x_{-i}) - 2\frac{x_i}{z_i} + 2\theta_i \gamma \left(1 - \frac{x_i}{z_i}\right)$$

which leads to $x_i = \frac{1}{2}\frac{z_i}{1+\theta_i\gamma}$ and profits are $\Pi_i = 2\left(1 - \frac{x_i}{z_i}\right)$. The ex-ante value for the politicians is

$$W_i = U_i + \gamma \beta_i \Pi_i$$

Clearly, they would choose $\theta_i = \beta_i$, and this would implement $x_i = \frac{1}{2}\frac{z_i}{1+\theta_i\gamma}$ and deliver ex-ante utility

$$W_i = U^* + 1 - 2\log 2 - \log(1 + \beta_i\gamma) - \log(1 + \beta_j\gamma) + 2\beta_i\gamma.$$

Recall that with supra-national regulation the value was

$$W^s = U^* + \log(m_\theta^s) + \log(M_\theta^s) + (1 + \beta_i\gamma)(2 - m_\theta^s - M_\theta^s),$$

for the optimally chose $\theta = \theta^s$ and the implied $m^s(\theta^s;\gamma)$ and $M^s(\theta^s;\gamma)$. We can show the following proposition

Proposition 4. *There exists an upper bound $\bar{\beta}$ on political bias such that, if $\beta < \bar{\beta}$, politicians of the two countries prefer to set up a common regulator as described in Proposition 1.*

Proof. Politicians prefer as supranational regulator as long as $W^s > W_i$. We have

$$W^s - W_i = 2\log 2 - 1 + \log(m_\theta^s) + \log(M_\theta^s) + (1 + \beta_i\gamma)(2 - m_\theta^s - M_\theta^s) + \log(1 + \beta_i\gamma) + \log(1 + \beta_{-i}\gamma) - 2\beta_i\gamma$$

When $\beta_i = \beta_{-i} = 0$, we have $m = M = 1$ and $W^s - W_i = 2\log 2 - 1 > 0$. By continuity this extends to values of β that are strictly positive. On the other hand, if $\beta\gamma$ is large, we can have $W^s - W_i < 0$. □

2.4 Summary of Model Predictions

The model yields three key predictions

1. **Proposition 1:** EU countries agree to set up an anti-trust regulator that is tougher and more independent than their old national regulators (and the US)
2. **Proposition 2:** US firms spend more on lobbying US politicians and regulators than EU firms
3. **Proposition 3:** Countries with weaker ex-ante institutions benefit more from supra-national regulation.

The rest of this paper tests these predictions. The vast majority of the data was gathered manually from the websites of competition authorities in a fairly extensive exercise. See the Data Appendix for additional details on the sources.

3 Proposition 1: Tougher and more independent regulator

Proposition 1 implies that a joint regulator is more likely to be a tough regulator. Empirically, we can break down this prediction into two components. The first is the regulatory design, i.e., the formal framework defining the potential actions of the regulator, which is called "Laws & Policy". To make this comparison we can rely on extensive existing research. The key prediction of our theory is that we should observe a discrete difference between the EU national regulators and the EU's supranational one.

The second prediction concerns the actions of the regulator. Even if a framework is formally tough, this does not mean that it is tough in practice. We therefore also consider actual regulatory actions, i.e. "Enforcement." This comparison is more complicated and the data are noisier but the results are consistent.

3.1 Laws and Policies

Let us start with the analysis of regulatory design. Figure 7 begins with the indicators of Competition Law & Policy published by the OECD in 2013 (Alemani et al., 2013). Indicators are available for each country's National Competition Authority (NCAs) as well as DG Comp (see Table 2 of Alemani et al. (2013)). In Europe, NCAs deal with cases that have national impact. The European Commissioner for Competition and the Directorate-General for Competition (DG Comp) enforce European competition law in cooperation with the NCAs. DG Comp prepares decisions in three broad areas: antitrust, mergers, and state aid.

Consistent with the predictions of our model, DG Comp is more independent and more pro-competition than any of the national regulators, and also than US regulators. DG Comp attains the lowest possible score (with lower being more stringent) in the three categories that directly map into our model: Scope of Action, Policy on Anticompetitiveness, and Probity of Investigation (which includes government interference). The fourth dimension, Advocacy (whether the regulator itself can advocate for a more competitive environment), is a bit less straightforward to map into our model, but even there, only the UK and Denmark offer more freedom than the EU.[10]

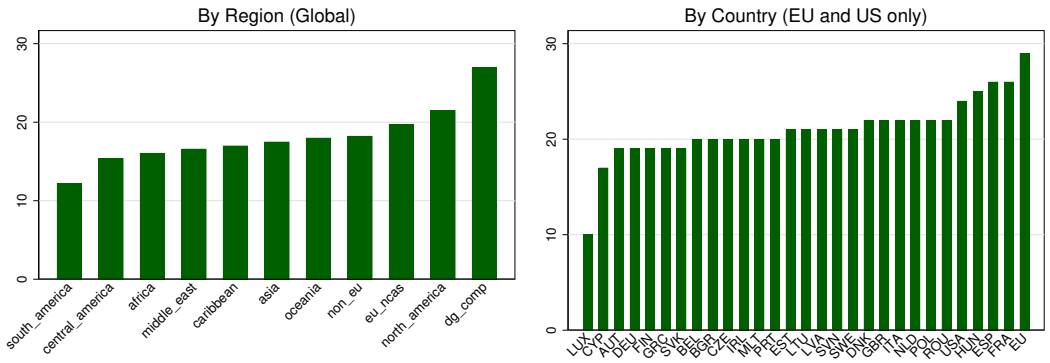
The scores reported in Figure 7 cover OECD countries. Hylton and Deng (2006) (HD hereafter) code key features of the competition laws of 102 countries, so we can expand our sample. In addition, the methodology used by HD is independent from the one used by the OECD (HD published their indexes first, and the OECD builds on previous, independent work). This is important because the construction of indexes can be somewhat subjective. Figure 8 summarizes their scores. The left plot shows the average score by

[10] See Appendix B for a brief history of Antitrust institutions on both sides of the Atlantic. The first of US institutions were established with the The Sherman Act of 1890. The foundations of European competition policies were established much later – in the 1957 Treaty of Rome, which built on the European Coal and Steel Community (ECSC) of 1951. Article 3(1)(g) of the Treaty of Rome envisions "a system ensuring that competition in the internal market is not distorted". Council Regulation 17 made the enforcement powers effective in 1962, and the EU Commission made its first decision in 1964. This regulation was modernized by regulation 1/2003, which has been effective since May 2004.

Figure 7: *Restrictions on Competition Law & Policy (OECD Indicators, 2013)*

Note: higher bar means more restrictions (less pro-competition enforcement). Sample includes EU countries plus AUS, CAN, JPN, KOR, NOR, CHE and USA. Here are a few examples of each category: Are there exemptions from the competition law for public and foreign firms (*scope of action*)? Are anticompetitive behaviors and anticompetitive mergers prohibited? Have there been interventions recently against such behaviors? (*policy on anticompetitiveness*)? Do governments interfere with the investigations or the decisions taken on antitrust infringements and mergers (*probity of investigation*)? Can regulators advocate for a more competitive environment, e.g., by performing market studies and delivering recommendations (*advocacy*)? Source: Alemani et al. (2013).

Figure 8: *Hylton and Deng Antitrust Indicators: Overall*



Notes: Higher bar means stronger competition law. Left plot shows the average total Antitrust "scope index" by region, as reported in Hylton and Deng (2006). EU NCAs measures the average score of member state's Competition laws before integration with EU law. Right plot shows the most recent score of individual countries, as well as those of DG Comp. Individual country scores may have been updated since publication of Hylton and Deng (2006), so we gather them manually from link.

region, while the right plot shows the scores of each EU country separately, along with the score of the US and the European Commission. HD conclude that *"in terms of overall scope, the strongest regions are predictably North America and EU Europe. If the scope of EU competition law is determined on the basis of national competition statutes, EU Europe follows closely behind the North America region.* ***If, on the other hand, the scope of EU law is determined on the basis of EU Treaty law, EU Europe is by far the strongest region in the world.***"[11]

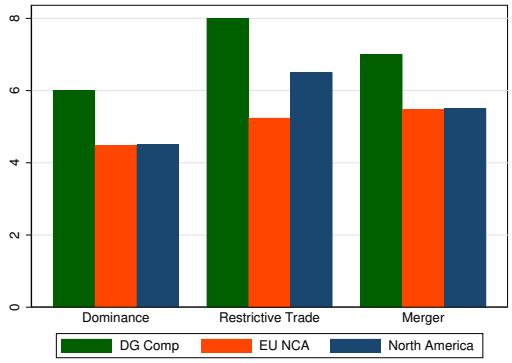
HD also separate their scores by type of economic conduct. Figure 9 shows that DG Comp is stricter across all types of conduct. To conclude, the OECD and HD scores provide a consistent picture of the regulatory landscape which is strongly supportive of the predictions of our model.

3.2 Enforcement

Do tougher policies translate into tougher enforcement? This section tackles this question by discussing recent trends in merger and non-merger enforcement. We emphasize at the outset that this is a difficult endeavor, for two main reasons. First, regulatory actions are an equilibrium outcome influenced by many factors, including expectations of market participants. We think that comparing the EU and the US allows us to control for common trends. But the second issue is that actions are not necessarily defined and measured consistently across different jurisdictions, particularly for non-merger enforcement as discussed in more detail below. The main exception is Bergman et al. (2010) who control for the specifics of each case across

[11] Several other indicators have been proposed in the literature. We focus on the OECD and HD scores because they (i) are well regarded in the literature, (ii) are among the most recent publicly available scores, (iii) cover a broad sample of countries, and (iv) separate the EU from the member states, a critical condition for testing our model. Among the remaining scores, the most prominent are those of Bradford and Chilton (2017); Voigt (2009); Buccirossi et al. (2011). However, neither Voigt (2009) nor Buccirossi et al. (2011) provide complete scores for the EU (Buccirossi et al. (2011) score DG Comp only in a subset of dimensions). Bradford and Chilton (2017) do separate the EU from member states but have not made their scores public. That said, their methodology builds on and closely resembles that of HD (though they complement these scores with data on Antitrust agency budgets and enforcement activity – a sizable contribution). Moreover, the fixed effects reported in Table 7 of Bradford and Chilton (2017) suggest that integrating EU law substantially increases the average score of member states.

Figure 9: *Hylton and Deng Antitrust Indicators: By Type of Economic Conduct*



Notes: Hylton and Deng (2006) scores by type of economic conduct. EU NCA equals the average score across EU countries before integration with EU law.

regions. This is an important caveat to keep in mind when making comparisons in levels of non-merger enforcement, which is why we mainly focus on trends.

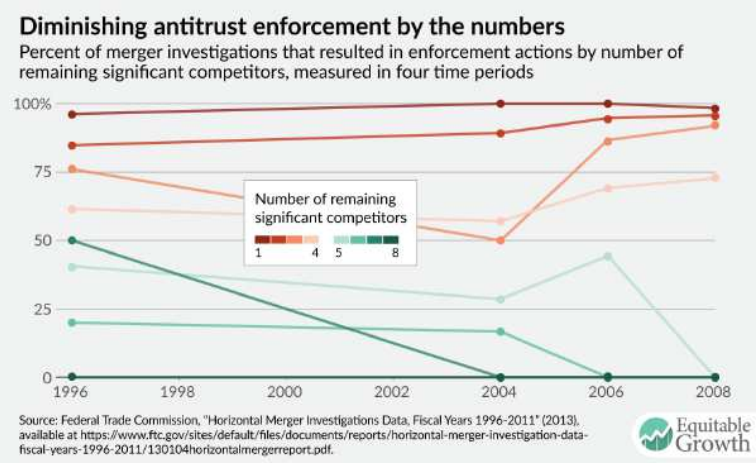
Before diving into the numbers, it is useful to make two preliminary points. The first point is that European Antitrust enforcement has remained active in recent years. Carree et al. (2010) show that, on average, 264 cases of antitrust, 284 cases of merger, and 1,075 cases of State aid were investigated every year from 2000 to 2004. Indeed, there is virtually no discussion of weak Antitrust enforcement in Europe – either in Academia or the media – compared to a growing body of work in the US.

The second point is that there is no evidence that EU and US regulators are biased for or against foreign firms. Carree et al. (2010) and Bradford et al. (2017), for instance, find that DG Comp decisions are not biased against foreign firms for non-merger and merger enforcement, respectively. Carree et al. (2010) conclude that "firms from non-European countries have fewer infringements, lower fines, and also lower appeal rates." This is not to say that EU decisions are uncontroversial. In fact, the Commission took several controversial decisions in recent years, including blocking the merger of General Electric and Honeywell (which had been approved by the US competition authorities) and ruling against Google in a case that was dismissed by US authorities five-years prior. But it has also taken many high-profile decisions against EU-based companies.

3.2.1 Merger Enforcement

Let us start with Merger enforcement because it is simpler to define and it has been extensively studied so we can rely on existing work. Bergman et al. (2010), in particular, study a detailed sample of EU and US merger investigations from 1993 to 2003. Their work is particularly useful because they control for the specifics of each case, and they ask the conceptually correct question: what would have been the outcome of the *same* case if it had been investigated by the *other* regulator? They find that the EU was tougher than the US for dominance mergers, in particular those involving moderate market shares. The differences are less stark following the 2004 EU Merger Reform, but the EU is still tougher on mergers involving moderate market shares, and it applies a more aggressive collusion policy than the US (Bergman et al., 2016).

Figure 10: *Declining Merger Enforcement in the US*



Sources: Kwoka (2017b)

In the US, there has been a clear shift in merger enforcement activity. Figure 10 shows that between 1996 and 2008, the FTC essentially stopped enforcing mergers when the number of remaining competitors is 5 or more. Notice that, at this stage, we do not take a stand on the efficiency of this policy. In particular, it might be the case that US enforcement is efficient while EU enforcement is too stringent. We return to this important issue in Section 6.

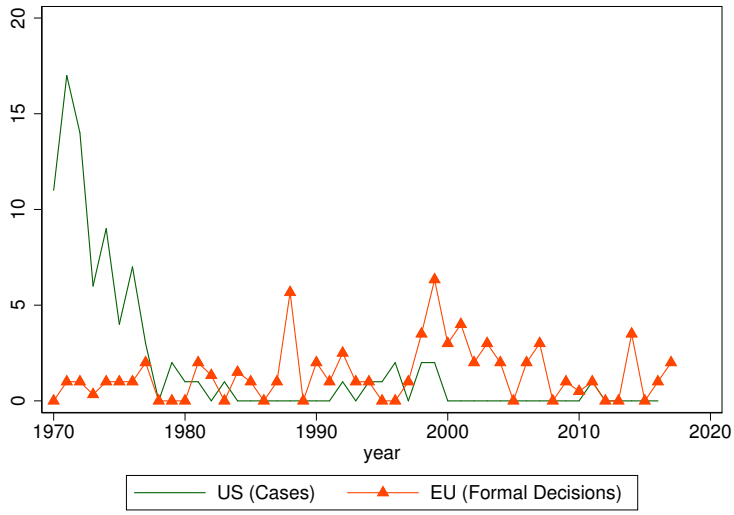
3.2.2 Non-Merger Enforcement

Moving on to non-merger enforcement, we follow the literature and separate the discussion by economic conduct: Abuse of Dominance, and Hard-core Cartels (price-fixing, bid-rigging and market sharing). We discuss other forms of restrictive trade in the Appendix. In order to provide a long time-series of enforcement, we often contrast the number of *cases* pursued by in the DoJ to the number of *formal decisions* made by DG Comp. This introduces two limitations. First, these are different objects. Formal decisions are substantially more restrictive than cases as DG Comp often resolves cases through commitments or rejections without the issuance of a formal decision. This biases the series against our prediction. Second, neither measure covers the full span of enforcement. Both the FTC and individual states have enforcement responsibilities in the US; and many antitrust cases originate by private litigation (particularly outside cartel and mergers, as discussed in OECD (2015)). Similarly, National Competition Agencies (NCAs) have enforcement responsibilities in Europe. Unfortunately, enforcement data for these additional plaintiffs is available only after the late 1990s/early 2000s – if at all. We include FTC cases in our regression analyses below, but focus on the DoJ here to study long run trends. We also note that DoJ enforcement trends are often used as a proxy of long run enforcement in the US antitrust literature (e.g., Ghosal et al. (2007)).

With these limitations, we can make the following claim: enforcement by DG comp has remained stable while enforcement by the DoJ has fallen dramatically.[12]

[12]The Appendix provides more detailed information about the various data sources and measurement issues. Figure 32 in the Appendix shows that the number of formal decisions made by DG Comp on non-merger cases has remained relatively stable since 1964. According to Carree et al. (2010), the early upward trend reflects DG Comp's growing legitimacy and jurisdiction, while the

Figure 11: *Abuse of Dominance Enforcement: DG Comp vs. DoJ*



Notes: DoJ Annual Reports for the US. Russo et al. (2010) for Europe, extended manually to 2017 based on DG Comp online case database.

Abuse of Dominance We begin with Abuse of Dominance, a concept that is arguably more important in Europe than the US. Figure 11 shows that DG Comp Abuse of Dominance enforcement has remained stable or increased since the 1970s, while it has all but disappeared in the US (at least at the DoJ). Indeed the DoJ has brought only 10 cases since 1990 and only one case since 2000. In fact, not only the number of cases has decreased, but the number of investigations has also fallen close to zero.[13]

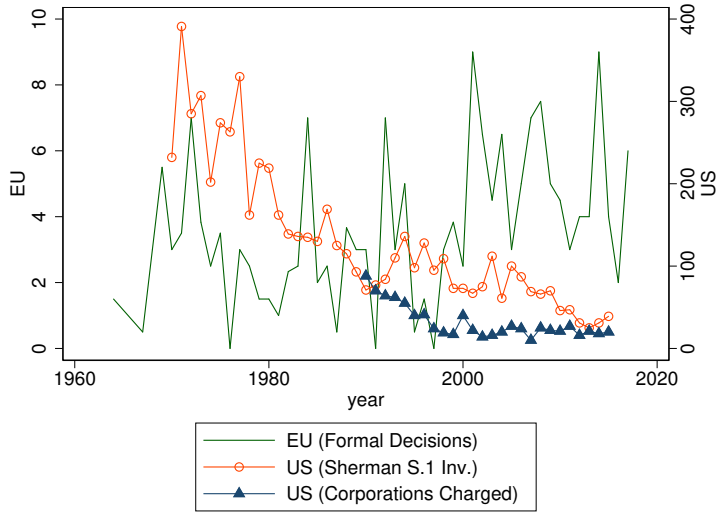
Cartels Let us move on to Cartel enforcement. Figure 12 shows the number of DG Comp Formal decisions (left) and the number of DoJ Investigations and corporations charged (right). DG Comp enforcement is stable/rising while DoJ enforcement is falling. It should be noted, however, that the comparison is complicated. Cartels are typically charged in criminal courts in the US while DG Comp can only pursue civil cases. In addition, we could measure the number of individuals charged, or the number of corporations charged. We show Investigations and Corporations charged in the US because they better reflect the number of violations charged by the DoJ. In recent years, however, the DoJ has increased its focus on charging individuals as well as corporations – which has resulted in more individuals being incarcerated and for longer periods of time.[14] As a result, one could argue that cartel enforcement has not decreased in the US, or at least not as much as suggested by Figure 12. The increase in EU enforcement, however, is unambiguous.

1990s decrease is due to changes in DG Comp's policies such as the creation of a block exemption regulation system and a stronger reliance on comfort letters instead of official decisions. In addition, around 1989 the DG Comp was burdened with enforcement of the then new merger control regulation. Up until the late 1990s, nearly half of the formal decisions related to exemptions (where the practice is allowed to continue) and negative clearance (where the practice is deemed to be in compliance with regulation). Such decisions essentially disappear in recent years, as the commission resolves nearly all such cases without formal decisions. Focusing on the number of infringements (i.e., actual violations), the number of formal decisions has been essentially flat – or even increased since 2000.

[13]This is not only the case for DG Comp. Figure 33 in the Appendix shows that nearly 40% of cases brought by European Competition Regulators (including NCAs) relate to Abuse of Dominance.

[14]This is a stated policy objective (link). See also Figure 34 in the Appendix for details.

Figure 12: *Cartel Enforcement: EU vs. US*



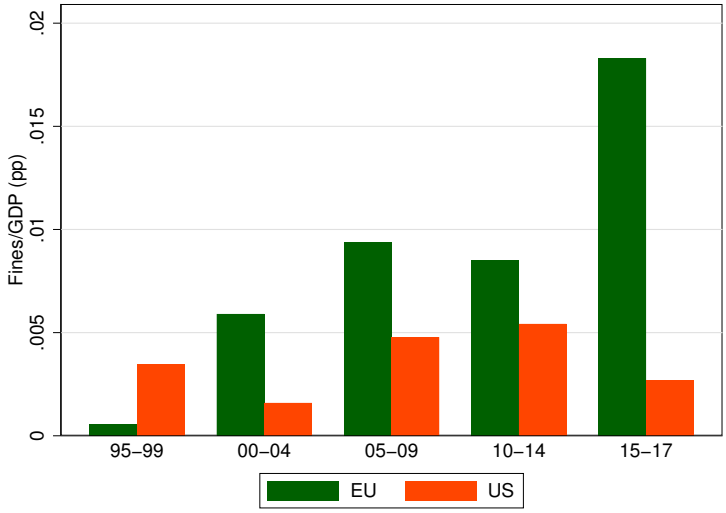
Notes: DoJ Annual Reports for the US. Russo et al. (2010) for Europe, extended manually to 2017 based on DG Comp case database.

Figure 13 shows that the EU has imposed substantially higher fines for Cartel Cases than the DoJ. The increase in Europe was particularly pronounced after 2000, with total cartel fines increasing from about 600 MM Euros in the 1990s to more than 15 billion from 2005 to 2014 (the last decade with available data). Considering all antitrust cases in Europe and controlling for the number of corporations fined we reach similar conclusions. The average fine per corporation imposed by DG Comp increased from less than 20 MM euros before 2000 to more than 300 MM in 2006-2008 (Russo et al., 2010), while the average fine imposed by DoJ remained under $50 MM euros for most of the 2000s.

4 Proposition 2: Larger lobbying expenditures in the US than in the EU

Proposition 2 predicts that political expenditures will be higher in the US than in Europe. This section tests this prediction by studying total lobbying and campaign contributions. We do not constrain expenditures to the antitrust agencies for two reasons. First, lobbying expenditures are often reported on a combined basis, so we are unable to isolate lobbying to competition agencies. Second, and more importantly, because we view the degree of independence as much broader than direct capture of antitrust professionals (as discussed above). Lobbying and political expenditures may not influence the antitrust agencies directly; but they may influence the courts that enforce antitrust laws or the politicians that design (and may change) the institutions, select the judges, allocate funding and choose the agency's leadership. They may also influence regulation and regulatory reform efforts to erect barriers to entry. All of these would limit the agency's abilities to promote competition, resulting in higher mark-ups.

Figure 13: *Cartel Enforcement Fines: US vs. EU*



Sources: DoJ Annual Reports and DG Comp Cartel Statistics 2017.

4.1 Lobbying

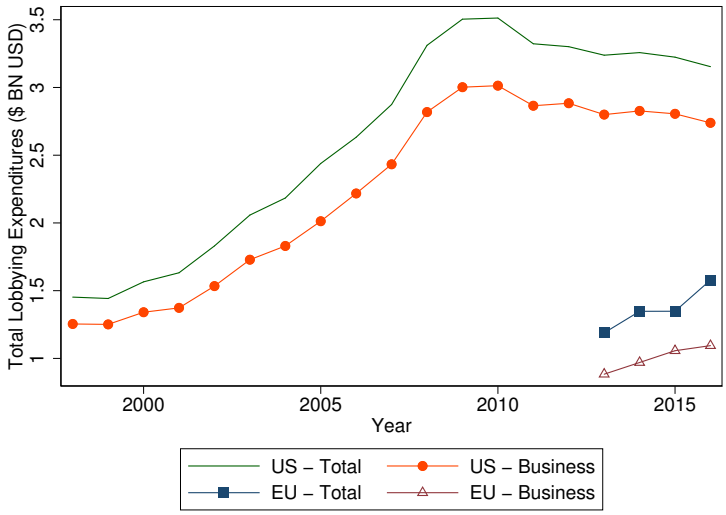
Expenditures Figure 14 begins by plotting total lobbying expenditures to the US Federal government and to European Union institutions. Data for the US come from the Center for Responsive Politics, which in turn sources data from the Federal Lobbying Disclosure Act Database. Data for Europe is based on LobbyFacts.com, which sources data from the EU Transparency Register. Lobbying expenditures in the US are more than twice as large as in Europe. Some caveats are warranted for the European data and we don't think the numbers are very precise. The differences are so large, however, that even if we are 20% off, the results are clear.[15] Moreover, the share of Lobbying done by Business, Lawyers and Lobbyists is much higher in the US (87%) than in Europe (70%).[16]

One may think that lobbying to European Union institutions is lower because firms must also lobby their individual countries. But this is also true in the US. In fact, total state-level lobbying expenditures for only 20 states in the US (which account for 58% of US GDP) totaled $1.43 BN in 2016 – nearly as much as total

[15]The direction of the bias is unclear. EU lobbying might be *under-estimated* because joining the Transparency Register is not mandatory. However, lobbying expenditures are extremely skewed, and large players are well captured in the data. Greenwood and Dreger (2013) estimated as of 2013 that 75% of businesses and 60% of NGOs active in engaging EU political institutions were in the Register, and the number of registrants has increased by more than 50% since then. On the other hand Lobbying may be *over-estimated* due to double-counting: the data contains the corporations that employ lobbying intermediaries as well as the lobbying intermediaries themselves. There are also some measurement issues with small firms and we follow LobbyFacts.com in applying restrictions based on the number of European Parliament passes and European Commission meetings to mitigate these issues. In particular, we drop observations in the top 5% of Lobbying expenditures by year for firms that have no European Parliament passes and no European Commission meetings. We also replace lobbying expenditures for the University College Dublin National University of Ireland, Dublin in 2015 with the prior year's quantity because it is an extreme outlier. The totals after applying these restrictions roughly match those reported in the media (e.g., link). Note also that most firms report ranges of lobbying expenditures rather than specific amounts. We take the mid-point of all ranges in our estimates. Annual totals for the EU are based on the complete register available through LobbyFacts.eu as of year-end 2012, 2013, 2014 and 2015.

[16]Ideally we would separate Business from Lawyers and Lobbyists, but it is a known issue for the Transparency Register that many businesses report as Lawyers and Lobbyists.

Figure 14: *Lobbying Expenditures: US vs EU*



Source: US Lobbying from the Center for Responsive Politics. EU Lobbying from LobbyFacts.com. See caveats for EU lobbying totals in text. US Business sector includes Agribusiness, Electronics, Construction, Defense, Energy, FIRE, Health, Lawyers and Lobbyists, Misc. Business and Transportation. EU business includes Professional consultancies/law firms/self-employed consultants and In-house lobbyists and trade/business/professional associations.

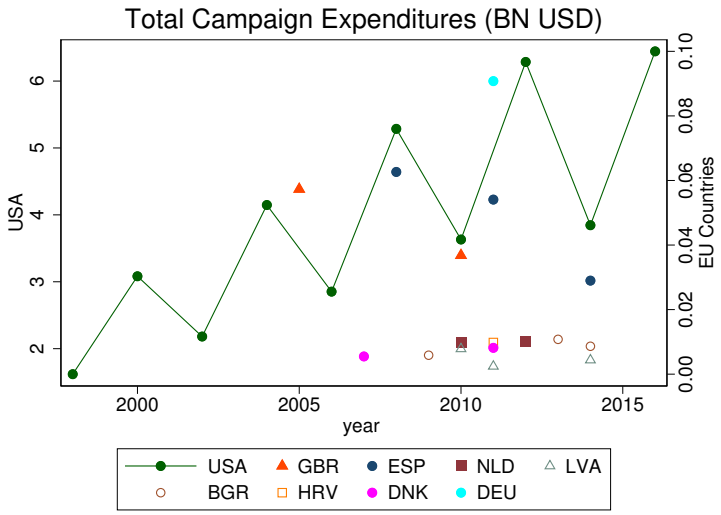
Lobbying to the EU (FollowTheMoney.org).

We can perform a potentially more precise comparison using firm-level data. In the EU, Dellis and Sondermann (2017) estimate an elasticity of lobbying expenditures to log-sales of 0.153 in 2017. Using a sample of US firms form Compustat[17], we obtain an elasticity more than four times larger (0.620). The same results hold if we control for sector fixed effects. The punch line is clear. Large firms in the US spend a lot more on lobbying, and this explains the large differences that we observe in the aggregate.

Outcomes. Our model also predicts that US lobbyists are more likely to succeed. In fact, in any rational model, spending and success should be correlated. Mahoney (2008) performs a large-scale comparative study of the two systems, researching the work of 150 lobbyists fighting over 47 different policy issues, half in the US and half in the EU. She concludes that *"In the US, 89% of corporations and 53% of trade associations succeed, while the majority of those fighting for the broader good – 60% of citizen groups and 63% of foundations – fail in their lobbying goals...In the EU, we see that industry often wins as well (the success rates are 57% for trade associations and 61% for lobbying firms) but citizen groups and foundations fighting for the public good win at equal rates (56% and 67%)."* She argues that these differences are because legislators in the US depend on wealthy interests for campaign contributions. We therefore turn to campaign finance next.

[17]We are grateful to Indraneel Chakraborty, Richard Evans and Rüdiger Fahlenbrach for providing a mapping from CRP's UltOrg to Compustat gvkeys

Figure 15: *Standardized Campaign Expenditures (BN USD)*



Source: US Campaign Expenditures from the Center for Responsive Politics, available at link. EU expenditures from EU (2015) for all countries except Germany, for which we use Bundestags-Drucksache (2013). EU standardized expenditures defined as total gross campaign expenditures in a given country's General Election for a given year, normalized by PPP of the given country to USD.

4.2 Campaign Contributions

If differences in lobbying expenditures between the US and the EU are large (a factor of two, or three for corporate lobbying), differences in campaign contributions are staggering. Figure 15 shows total campaign contributions for federal elections in the US (left axis) and total campaign expenditures for several European countries (right axis) with different scales to fit on the same figure. The sample of European countries is primarily based on EU (2015), and was chosen to be representative of the European economy. Campaign contributions in the US are more than 50 times larger than those of European economies. As is the case with lobbying, the distribution of campaign contributions is extremely skewed and an outsized share of Campaign expenditures comes from large businesses and very wealthy individuals. Gutiérrez and Philippon (2017c) provide a more detailed analysis of the composition of lobbying and campaign contributions.

The role of money and business interests in US politics has been documented in several dimensions. The Vital Statistics on Congress published by the Brookings Institution show that the share of businessmen in US politics has increased over time. Epstein et al. (2013) show that Supreme Court decisions have become increasingly business-friendly. Moreover, FTC and DoJ officials can be influenced by elected politicians. For instance, upon initiating its investigation of Google, the FTC received more than 13 letters from US congressmen, including one from Jared Polis which stated that *"application of anti-trust against Google would be a woefully misguided step that would threaten the very integrity of our anti-trust system, and could ultimately lead to Congressional action resulting in a reduction in the ability of the FTC to enforce critical anti-trust protections."* European members of parliament would be unlikely to write a letter like the one Jared Polis wrote, and even if they did, it would not be influential because of DG Comp's independence. In the US, Mehta et al. (2017) show that political connectedness and political expenditures lead to favorable

outcomes in Merger reviews. And Gutiérrez and Philippon (2017c) show that industries that lobby more in the US have had fewer non-merger cases, controlling for the endogeneity of lobbying activity.

5 Proposition 3: Cross-Sectional Implications

A classic idea in the literature on credible monetary policy is that countries with worse initial institutions (stronger biases or commitment problems) benefit more from external commitments. Similarly, proposition 3 predicts that countries with initially high perceived α experience larger improvements in competition thanks to EU institutions.

We have shown in the previous Section that the data strongly support the prediction of the model regarding antitrust institutions. In this Section we focus on another important determinant of competition: Product Market Regulation (the appendix shows similar results for antitrust). One important caveat to keep in mind is that – unlike Antitrust – EU institutions have only partial oversight over Member State's regulatory environments. The EU can directly prohibit certain domestic regulations (e.g., prohibition of Golden Shares and price controls in transportation industries), it can work with member countries to achieve mutual recognition of restrictions, or can enact case law based on a treaty (e.g., ongoing regulation of State Aid by DG Comp). In other cases, the countries themselves must implement the reforms and the EU's influence takes the form of peer-pressure and disclosure.[18]

5.1 History

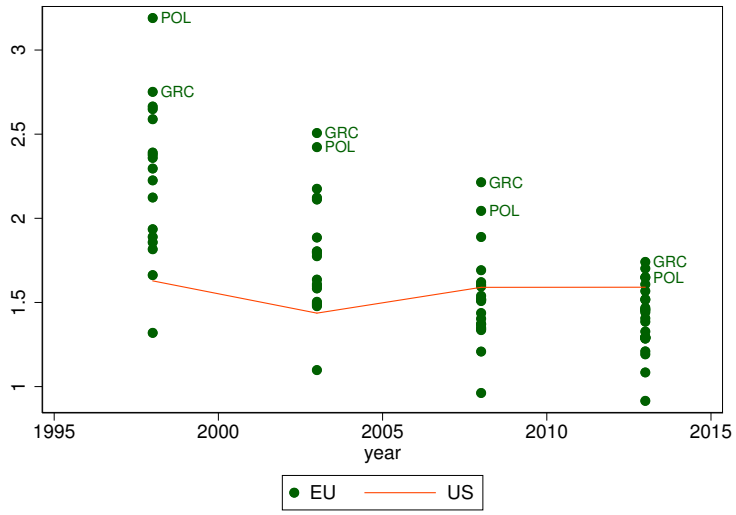
Concerted, EU-wide reform efforts started in 1985 with the Single Market Plan, and accelerated in the 2000s with the introduction of the Lisbon Strategy.[19] With regards to product market competition, the Lisbon Strategy aimed *"at opening up product markets to competition in particular by completing the internal market for goods and services, by removing obstacles to competition in Member States and by creating a business environment more conducive to market entry and exit."(Zeitz, 2009)* While the Lisbon Strategy failed in some other dimensions, substantial product market reforms were implemented, as shown in Figure 16 using the OECD's Product Market Regulation indices for the US (line) and European countries (dots).[20] The US was a clear leader in PMR in the late 1990s, following the extensive deregulation of the 1980s and

[18] During the implementation of the Lisbon Strategy, for example, the overall objectives were set jointly by the EU and Member States. From then on, Member States were in charge of implementation, but were also required to submit reports to the European Commission on an on-going basis: the so-called Cardiff Reports from 200-2004, followed by National Reform Programs and implementation reports. The EU used those reports to continuously monitor and disclose progress – including the creation of the Microeconomic Reform database (MICREF) which compiled and tracked progress across all states. Indeed, EU and peer pressure were seen as key 'embarrassment tools' available to encourage reform. And, if countries still fail to implement required reforms, the Commission may curtail the allocation of the EU Cohesion Funds. Last, for states in the process of accession, stringent reform requirements are negotiated in advance – as evidenced by the substantial reforms implemented at new EU Member States in Central and Eastern Europe.

[19] Some countries (such as the UK) pursued economic deregulation independently as early as 1979.

[20] The World Bank and the World Economic Forum also publish measures related to Regulatory Barriers to competition. Appendix Figure 40 shows that European countries have also improved according to World Bank measures, as well as tangible WEF measures such as the number of days required to open a business. Subjective WEF measures suggest a different story, but they are likely less reliable since they are based on a survey of business executives. We focus on the OECD's measures because they are more widely accepted, detailed and specific. For instance, they are a key tool for the OECD/IMF joint assessment the growth strategies submitted by G20 countries. See Pelkmans (2010) for a discussion of the alternate measures of regulatory barriers.

Figure 16: *Product Market Regulation: US vs EU*



Note: OECD PMR. Figure includes all countries in EU by 2004. PMR scores for some countries available only in recent years.

1990s. It obtained the second highest score across all countries, behind only Great Britain. Since then, however, PMR decreased drastically for all EU economies, yet remained stable in the US. Indeed, by 2013, very few countries scored worse than the US – and by a small margin.[21]

How have European countries been able to reduce Regulatory Barriers? They have implemented far more reforms than the US in recent periods. Duval et al. (2018) construct a database of major labor and product market reforms across 26 advanced economies and 7 network industries from 1970 to 2013, based on a detailed review of past *OECD Economic Surveys* as well as regulatory indicators.[22] Positive reforms are coded as 1 while counter-reforms are coded as -1. Figure 17 shows the average number of reforms implemented by European Countries – which started to rise in the mid-1980s and include a large wave in the 2000s.[23] Duval et al. (2018) use a Diff-in-Diff framework to show that the implementation of reforms increases output.

5.2 Cross-Sectional Predictions

Let us now test the idea that countries benefit more from EU integration when their institutions are initially weak (proposition **3**). We define weak countries either as those with initially large barriers to entry, or those with initially weak corruption control.

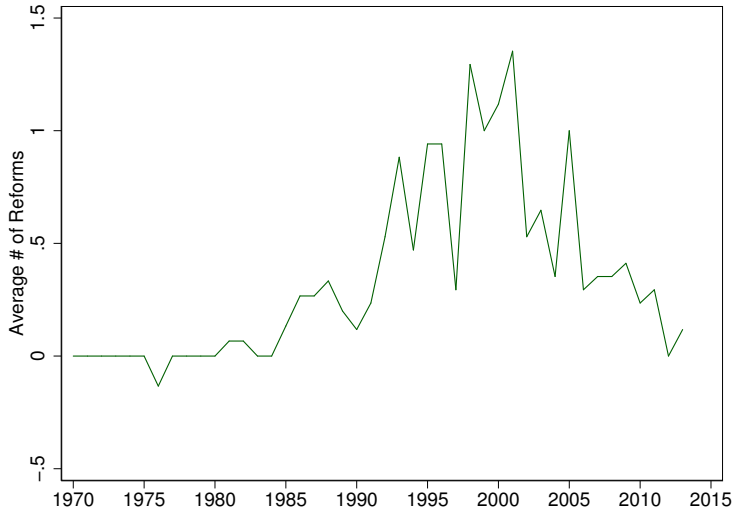
Figure 18 plots the change in PMR from 1998 to 2013 against the starting value in 1998. There has been a global convergence towards less regulation, and, consistent with our model, the convergence is faster for

[21] Moreover, some have argued that PMR scores are biased upward in Europe. In particular, Pelkmans (2010) notes that the OECD's PMR indicators (i) neglect areas where EU regulation is particularly strong (e.g., Safety, Health, Environment and Consumer Protection) and (ii) focus on individual countries, without accounting for the benefits of a single market for regulation and competition.

[22] The seven network industries are those covered by the OECD's indicators of regulation, which include electricity, gas, telecommunications, postal services, rail transport, air transport and road transport.

[23] See Appendix Figure 39 for the number of reforms implemented by each country.

Figure 17: *Average Number of Product Market Reforms across EU countries*



Source: Duval et al. (2018)

EU countries than for non-EU countries. The difference is statistically significant (t-stat of -2.29).

The differences are even more striking when we consider initial corruption control. The Left Panel of Figure 19 plots changes in PMR indices against the World Bank's Corruption Control index, as of 1996.[24] PMRs decreased precisely at those countries with initially weaker institutions in Europe, while the relationship is much weaker in the rest of the world. Finally, the Right Panel of Figure 19 shows that these results are indeed driven by the number of implemented Product Market Reforms from 1998 to 2013, as measured by Duval et al. (2018).[25]

6 Real Effects

So far we have tested and validated all the positive predictions of the model. We have not made normative statements, however. The evidence for stronger antitrust enforcement and decreasing barriers to entry in Europe is strong. But there are at least three questions that we still need to answer:

1. Do the regulatory reforms that we emphasize actually explain the decrease in concentration in Figure 1?

2. Do they lead to lower profit rates?

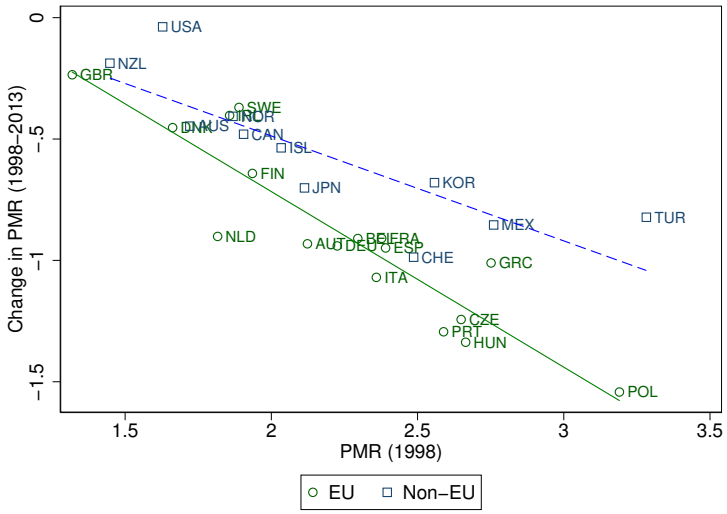
3. Is there a trade-off between competition and innovation?

We ask these questions separately for Product Market Regulation and Antitrust.

[24] We find similar results using Government Effectiveness instead of Corruption Control

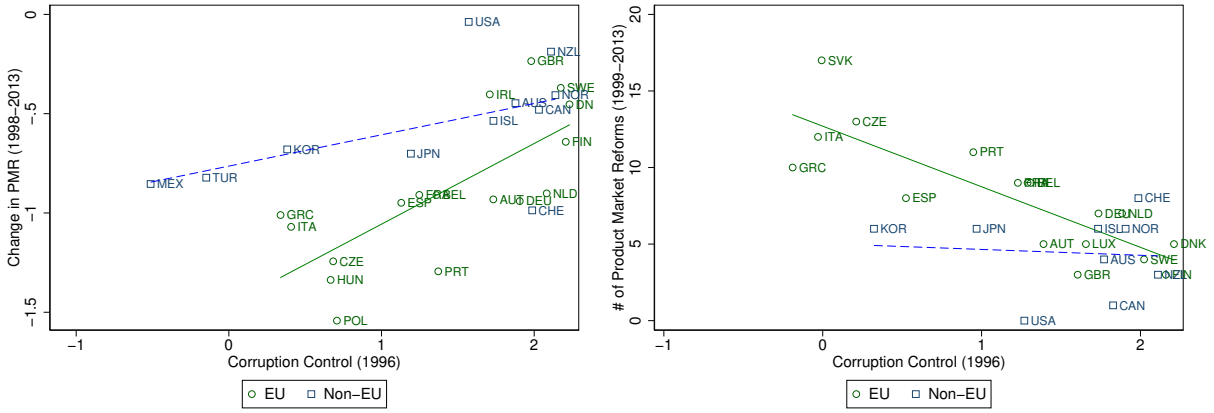
[25] Appendix Figure 38 shows that convergence of PMR indices across levels of Corruption Control is unique to the EU. Non-EU countries continue to exhibit a strong positive relationship between PMR and Corruption Control as of 2013.

Figure 18: *PMR Convergence: EU vs. Other Countries*



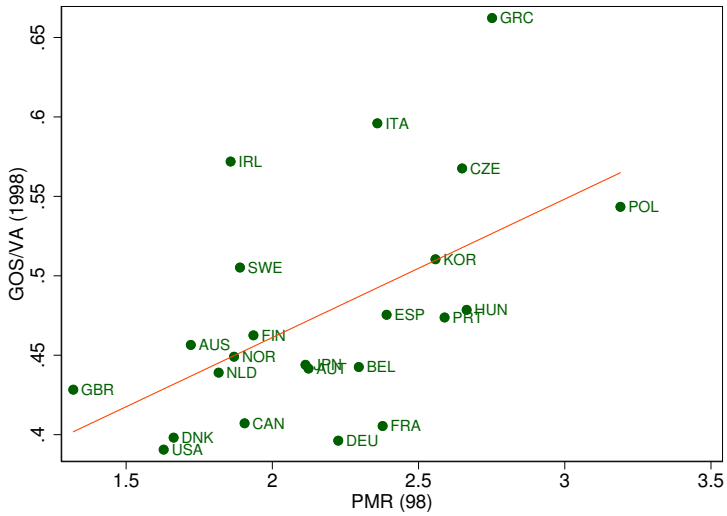
Note: OECD PMR. Includes all countries with a PMR score as of 1998.

Figure 19: *PMR Convergence and Reforms vs. Initial Corruption Control*



Notes: Left panel shows the change in each country's PMR score from 1998 to 2013 against the World Bank's measure of Corruption Control as of 1996. Includes all countries with a PMR score as of 1998 and a corruption control score as of 1996. Right panel shows the number of major product market reforms implemented from 1999 to 2013 (as measured by Duval et al. (2018)) against Corruption Control in 1996. The differences in slopes are statistically significant: the t-stat for left panel is 2.19, controlling for the starting PMR. T-stat for right panel is 2.16.

Figure 20: *PMR vs. Profits (1998)*



Note: PMR from OECD. Profitability from OECD STAN for Non-Agriculture Business sector excluding RE. Sample includes EU countries plus AUS, CAN, JPN, KOR, NOR, CHE and USA.

6.1 Product Market Regulation

We start with Product Market Regulation because we think the theoretical case is unambiguous. We do not know of any plausible model where barriers to entry are inefficiently low. The only question, then, is whether Product Market Regulations matter. They might not be binding and/or our proxies could be noisy and biased by political window-dressing. Figure 20 shows that this is not the case. Higher levels of PMR are reflected in higher profit rates. The figure shows the data for 1998, which is the first year when PMRs are available. Countries like Greece and Poland had the highest PMR indices and Gross Profit Rates among advanced economies. By contrast, the US and Great Britain had the lowest regulatory restrictions and profit rates. We confirm that these relationships are statistically significant for profitability and concentration in Appendix table 4.

Our results are consistent with the literature. Alesina et al. (2005); Ciccone and Papaioannou (2007); Klapper et al. (2006); Thum-Thysen and Canton (2017); Cette et al. (2018); Griffith et al. (2010) and Duval and Furceri (2016), for example, find a negative relationship between product market regulations and alternate measures of investment, entry, technological change, mark-ups and growth. Griffith et al. (2010), in particular, focus on reforms carried out under the EU Single Market Program and conclude that reforms "were associated with increased product market competition, as measured by a reduction in average profitability, and with a subsequent increase in innovation intensity and productivity growth for manufacturing sectors."

6.2 Antitrust Enforcement

Antitrust enforcement is a lot more complicated to analyze than barriers to entry. Measurement issues are worse because cases are lumpy, and in the case of mergers, come in waves. More importantly, antitrust enforcement involves a potential trade-off between current consumer surplus and innovation or investment.

In Lim and Yurukoglu (2018), for instance, regulators cannot commit to future rates of returns on capital. In addition, regulators may lack the knowledge to understand the impact of innovations on consumer welfare, or they may under-estimate the efficiency benefits of large firms. Firm lobbying can add value by communicating specialized information to these regulators. This is reflected in the theoretical literature on lobbying that emphasizes three distinct modeling traditions: contests for policy rent, strategic information transmission, and multiple means models (Gregor, 2011).

It is therefore possible that stronger enforcement in Europe comes at the cost of lower investment and/or lower innovation than in the US. We test these ideas by studying the effects of enforcement on concentration, profitability and productivity across industries and across regions. Table 3 presents our results.We regress changes in EU concentration, profitability and TFP on the number of antitrust cases in the corresponding industry, controlling for changes in US concentration, profitability and TFP as well as US enforcement.The US controls account for unobserved technological changes that may affect equilibrium concentration, profit rates, or the desirability of pursuing a case across regions.

For concentration, for example, we regress the change in top-4 firm concentration ratios in industry j and year t in Europe

$$\Delta log\left(CR4\right)_{j,t-2,t}^{EU} \equiv log\left(CR4_{j,t}^{EU}\right) - log\left(CR4_{j,t-2}^{EU}\right)$$

on the number of Antitrust cases in Europe, $\#\left\{\text{Cases}\right\}_{j,t-2,t}^{EU}$, controlling for changes in concentration in the US

$$\Delta log\left(CR4\right)_{t-2,t}^{US} \equiv log\left(CR4_{t}^{US}\right) - log\left(CR4_{t-2}^{US}\right)$$

and the number of US cases, $\#\left\{\text{Cases}\right\}_{j,t-2,t}^{US}$.[26]

Columns 1 and 2 of Table 3 show that stronger enforcement leads to less concentration and lower profit rates, respectively. These results show that the impact of enforcement is material. They do not, however, shed light on the potential trade-off between enforcement and investment or innovation. Column 3 studies this trade-off, and shows that stronger enforcement in Europe is correlated with faster TFP growth.Figure 21 presents bin-scatter plots of the concentration and productivity relationships, which appear reasonably robust.

These results are consistent with previous work linking country-level competition policies to TFP growth (Buccirossi et al., 2013; Voigt, 2009). We expand on this literature by studying outcomes of actual enforcement at the more granular industry-level; and using the US as a control group for EU enforcement activity. Appendix Tables 5 to 7 present more detailed results, separating merger and non-merger enforcement. The data are noisy and the coefficients are not always very significant, but they almost always exhibit the expected sign.[27]

[26] In unreported tests, we regress the double differences of changes in concentration, profitability and TFP between the EU and US

$$\Delta^2 log\left(CR4\right)_{j,t-2,t}^{EU-US} = \Delta log\left(CR4\right)_{j,t-2,t}^{EU} - \Delta log\left(CR4\right)_{j,t-2,t}^{US}$$

on the differences in enforcement between regions, $\Delta Cases_{,j,t}^{EU-US} \equiv \#\left\{\text{Cases}\right\}_{j,t}^{EU} - \#\left\{\text{Cases}\right\}_{j,t}^{US}$ .This specification restricts the coefficient on US cases and enforcement to minus one. It yields consistent results.

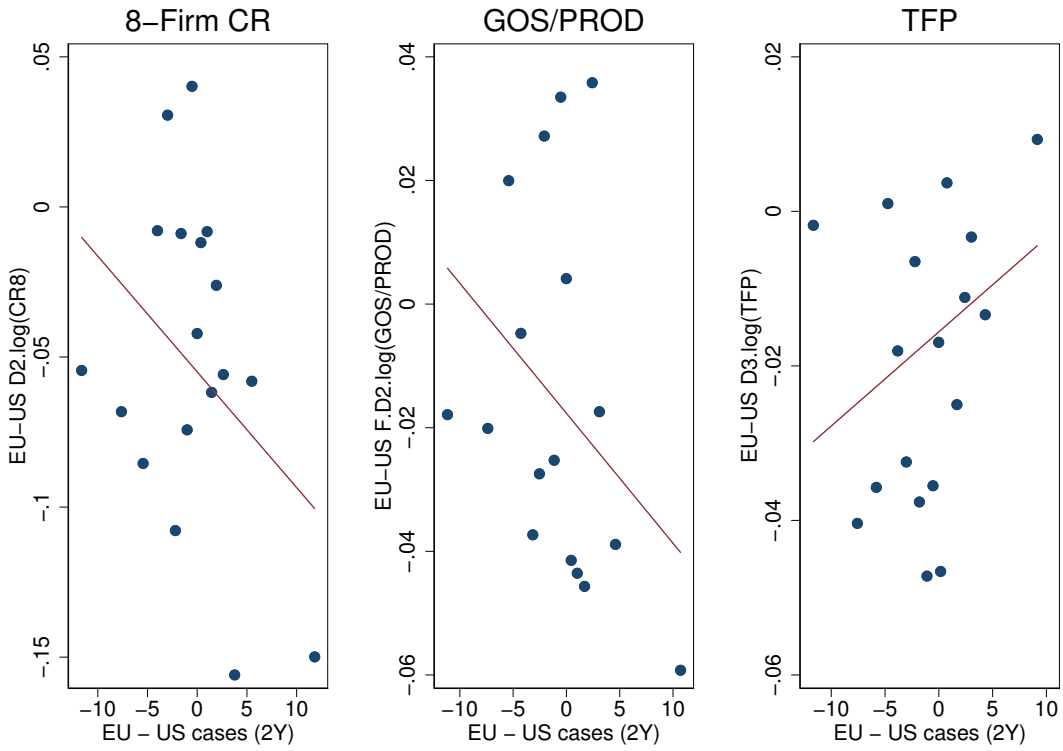
[27] The only exception of a positive coefficient when regressing concentration on mergers without year fixed effects. This is likely

Table 3: *Real effects of Differences in Cases*

Table reports panel regression results of the effects of European enforcement activity on changes in concentration, profitability and TFP, controlling for the corresponding changes and cases in the US. Concentration measures based on Amadeus for Europe and Compustat for the US. Profit rates from OECD STAN, defined as the ratio of gross operating surplus to gross output. Value added-based TFP growth from EU KLEMS 2017. Enforcement activity gathered manually from the DoJ, FTC and DG Comp websites. Industry segments based on EU KLEMS. Standard errors clustered at the industry-level in brackets. + p<0.10, * p<0.05, ** p<.01.

	(1) $\Delta log(CR4)^{EU}_{t-2,t}$	(2) $\Delta log(PR)^{EU}_{t-1,t+1}$	(3) $\Delta log(TFP)^{EU}_{t-2,t}$
$\#Cases^{EU}_{t-2,t}$	-0.015**	-0.003+	0.002*
	(0.004)	(0.002)	(0.001)
$\#Cases^{US}_{t-2,t}$	0.005	-0.001	0.001
	(0.008)	(0.002)	(0.001)
$\Delta log(CR4)^{US}_{t-2,t}$	0.100		
	(0.191)		
$\Delta log(PR)^{US}_{t-1,t+1}$		0.121	
		(0.073)	
$\Delta log(TFP)^{US}_{t-2,t}$			0.277**
			(0.069)
Industry FE	Y	Y	N
R^2	0.03	0.07	0.14
N	324	389	364

Figure 21: *Real effects of Differences in Cases*



Notes: Bin-scatter plot of EU minus US changes in Concentration, Profitability and TFP vs. differences in enforcement activity across regions. TFP plot omit Mining and Manufacturing - Petroleum given the influence of Fracking.

7 Conclusion

We have provided a comparative analysis of antitrust and product market regulations in the EU and the US. Our model account for the stunning reversal of concentration and competition between the two regions over the past 20 years. One important insight is that the changes that we uncover happen slowly and only become visible over a decade or two. This might explain why they have so far remained unnoticed.

We also argue that the comparison with Europe is useful to understand the US experience, and especially the rise in concentration, which is an important issue for future research.

because merger cases increase with merger waves, when concentration also increases. The coefficient turns negative (although not significant) when controlling for merger waves with year fixed effects.

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Appendices: Not Intended for Publication

We provide four Appendices:

- Appendix A discusses model extensions
- Appendix B discusses the history of Antitrust and Regulatory institutions in the US and Europe.
- Appendix C presents additional results on Concentration, Antitrust and Regulation
- Appendix D discusses the data used throughout the paper

A Model Extensions

A.1 General Utility

As in the logarithmic case, since firms in industry i cannot set a markup higher than μ_i, firms choose the maximum price $p_i = (1+\mu_i)\, w/z_i$. Given prices and wages, household maximize

$$U = \max \sum_{i=1}^{2} u(x_i) - n$$
$$s.t. \sum_{i=1}^{2} p_i x_i = wn + \sum_{i=1}^{2} \Pi_i^{\$}$$

where $\Pi_i^{\$}$ are nominal profits from industry i. Let λ be the Lagrange multiplier on the budget constraint. We have $u'(x_i) = \lambda p_i$ and $1 = \lambda w$. Using the equation for price, we then get $u'(x_i) = 1+\mu_i$. So there is simple direct mapping between the markups and the quantities produced in equilibrium. We can therefore think of the regulator as indirectly choosing the quantities $\{x_i\}_{i=1,2}$. This leads to the indirect utility function for the households

$$U(\{x_i\}_i) = \sum_{i=1}^{2} u(x_i) - x_i/z_i$$

Real Profits (nominal profits divided by wage) are

$$\Pi_i \equiv x_i p_i/w - x_i/z_i = \mu(x_i)\, x_i/z_i$$

Note that

$$\frac{\partial \Pi}{\partial x_i}(x^\star) < 0$$

This is simply because $\mu(x^\star) = 0$ and $\frac{\partial \mu(x_i)}{\partial x_i} < 0$. We assume for convenience that $\frac{\partial \pi}{\partial x_i} < 0$ for the relevant range of values.[28]

[28] For instance, if $u \equiv \log$, then $x^\star = 1$ and $\pi_i(x_i) = 1 - x_i$.

Welfare and Capture Ex-Post With general utility, the problem of the regulator is:

$$\max_{\{x_i\}} U\left(\{x_i\}_i\right) + \theta\gamma\Pi_\epsilon$$

Let us define x^ϵ as the solution to

$$u'\left(x^\epsilon\right) \equiv 1/z_i - \theta\gamma\Pi'\left(x^\epsilon\right)$$

Lemma 4. *The equilibrium under regulation is*

$$x_i\left(\epsilon = i\right) = x^\epsilon$$
$$x_i\left(\epsilon \neq i\right) = x^\star$$

where $x^\epsilon < x^\star$. The indirect utility is

$$U\left(\epsilon, \theta\right) = \bar{U}\left(\theta\right) = u\left(x^\star\right) - x^\star/z_{i\neq\epsilon} + u\left(x^\epsilon\right) - x^\epsilon/z_{i=\epsilon}$$

and profits are positive if $i = \epsilon$and zero otherwise.

Proof. The regulator sets markup limits to maximize

$$\sum_{i=1}^{2} u\left(x_i\right) - x_i/z_i + \theta\gamma\Pi\left(x_\epsilon\right)$$

The first order conditions are then

$$u'\left(x_i\right) = 1/z_i - \theta\gamma\Pi'\left(x_i\right)1_{\epsilon=i}$$

and $x^\epsilon < x^\star$ since $\pi'\left(x^\star\right) < 0$. □

Note that, because of symmetry, $U\left(\epsilon, \theta\right)$ does not actually depend on whether $\epsilon = 1$ or $\epsilon = 2$.

Ex-ante Design of Regulatory Independence. This part of the problem is unaffected by the specification of the utility function and in particular we still have that politicians at design stage would set $\theta = \beta$ where β captures the bias of the politician.

Supra-national Regulatory Design. Now we extend our model to two countries with specialized production. Again, by law of one price and balance of trade, we have that $w_i = w_j$ and $x_{ij} = x_{ii} = x_i$. By market clearing, we have that $z_i n_i = x_{ij} + x_{ji} = 2x_i$, so

$$n_i = \frac{2x_i}{z_i}$$

Then, we can write the indirect utility of consumers in country i as

$$U_i(\{x_i\}_i) = u(x_i) + u(x_j) - \left(\frac{2x_i}{z_i}\right)^{1/\alpha}$$

Lets call profits under the supra-national regulator Π^s. Real profits of the firm are

$$\Pi_i^s(\mu) = 2\mu(x_i)x_i/z_i$$

Thus, compared with profits in the one country model, we have $\Pi^s = 2\Pi$. The objective of the regulator is

$$\begin{aligned}\mathcal{R} &= \max_{\{x_i\}} U_{i=\epsilon} + (1-\theta)U_{i\neq\epsilon} + \theta\gamma\Pi^s_{i=\epsilon} \\ &= \max(2-\theta)u(x_{i=\epsilon}) + (2-\theta)u(x_{i\neq\epsilon}) - \frac{2x_{i=\epsilon}}{z_{i=\epsilon}} - (1-\theta)\frac{2x_{i\neq\epsilon}}{z_{i\neq\epsilon}} + \theta\gamma\Pi^s_{i=\epsilon}\end{aligned}$$

The first order condition for $x_{i=\epsilon}$ is:

$$(2-\theta)u'(x_{i=\epsilon}) = 2/z_{i=\epsilon} + \theta\gamma\Pi'^s(x_{i=\epsilon}) = 2[1/z_{i=\epsilon} + \theta\gamma\Pi'(x_{i=\epsilon})]$$

In order to compare to the first order condition in the one country model, Lets call the solution to this equation $x^s_{i=\epsilon}$ and the solution in the one country model $\bar{x}_{i=\epsilon}$. For the one country model, we had $u'(\bar{x}_i) = 1/z_i - \theta\gamma\Pi'(\bar{x})\,1_{\epsilon=i}$. Then, we have that $u'(x^s_{i=\epsilon}) = \frac{2}{2-\theta}u'(\bar{x}_{i=\epsilon})$, which implies that $x^s_{i=\epsilon} < \bar{x}_{i=\epsilon}$ as in the case with logarithmic preferences.

For $x_{i\neq\epsilon}$, the first order condition is

$$(2-\theta)u'(x_{i\neq\epsilon}) = 2(1-\theta)/z_{i\neq\epsilon}$$

Again, comparing the first order condition its easy to see that $x^s_{i\neq\epsilon} > \bar{x}_{i\neq\epsilon}$, so we have that with general utility the problem of the supra-national regulator has the same distortions with respect to the one-country problem than in the logarithmic case. Finally,

A.2 Decreasing Returns

We consider the case where the production function is

$$x_i = z_i n_i^{\alpha}$$

Now the profits of the firm are $\Pi_i \equiv \pi(x_i) = x_i p_i/w - (x_i/z_i)^{1/\alpha}$. Thus, calculating the marginal cost and using the definition of markups we get

$$p_i = \frac{1+\mu_i}{z_i}\frac{w}{\alpha}\left(\frac{x_i}{z_i}\right)^{\frac{1-\alpha}{\alpha}}$$

The consumption problem is the same as before, so $w/p_i = x_i$. Replacing and solving for x_i we get

$$x_i = \alpha^{\alpha}\frac{z_i}{1+\mu_i}$$

Thus, the regulator is indirectly choosing x_i, and the welfare maximizing quantity is $x^* = \alpha^{\alpha} z_i$.

Welfare and capture ex-post. The politicians maximize $V(\epsilon) = U + \gamma\Pi_\epsilon$. Since they have influence θ over the regulator, the regulator maximizes

$$\mathcal{R} = \max_{\{x_i\}} (1-\theta) U + \theta V(\epsilon) = U(\{x_i\}_i) + \gamma\theta\Pi_\epsilon$$

With $x_i = z_i n_i^\alpha$ we have that indirect utility is

$$U(\{x_i\}_i) = \sum_{i=1}^{2} \log(x_i) - \left(\frac{x_i}{z_i}\right)^{1/\alpha}$$

and reals profits can be written as

$$\Pi_i = 1 - \left(\frac{x_i}{z_i}\right)^{1/\alpha}$$

Thus, the problem of the regulator is maximize

$$\sum_{i=1}^{2} \log(x_i) - \left(\frac{x_i}{z_i}\right)^{1/\alpha} + 1_{\epsilon=i}\theta\gamma\left(1 - \left(\frac{x_i}{z_i}\right)^{1/\alpha}\right)$$

The solution to this problem is $x_{\epsilon\neq i} = \alpha^\alpha z_i$ and $x_{\epsilon=i} = \left(\frac{\alpha}{1+\theta\gamma}\right)^\alpha z_i$. Then. we have that $m = x_{i=\epsilon}/z_{i=\epsilon} = \left(\frac{\alpha}{1+\theta\gamma}\right)^\alpha$ and $M = x_{i\neq\epsilon}/z_{i\neq\epsilon} = \alpha^\alpha$

Ex-ante Design of Regulatory Independence. This problem is unaffected by the production function and in particular we still have that politicians at design stage would set $\theta = \beta$ where β captures the bias of the politician.

Supra-national Regulatory Design. Now we extend our model to two countries with specialized production. Again, by law of one price and balance of trade, we have that $w_i = w_j$ and $x_{ij} = x_{ii} = x_i$. By market clearing, we have that $z_i n_i^\alpha = x_{ij} + x_{ji} = 2x_i$, so

$$n_i = \left(\frac{2x_i}{z_i}\right)^{1/\alpha}$$

Then, we can write the indirect utility of consumers in country i as

$$U_i(\{x_i\}_i) = \log(x_i) + log(x_j) - \left(\frac{2x_i}{z_i}\right)^{1/\alpha}$$

and real profits of the firm as

$$\Pi_i = 2 - \left(\frac{2x_i}{z_i}\right)^{1/\alpha}$$

Plugging-in in the objective of the regulator, we have

$$\mathcal{R} = \max_{\{x_i\}} U_{i=\epsilon} + (1-\theta)U_{i\neq\epsilon} + \theta\gamma\Pi_{i=\epsilon}$$
$$= \max (2-\theta)log(x_{i=\epsilon}) + (2-\theta)log(x_{i\neq\epsilon}) - (1+\theta\gamma)\left(\frac{2x_{i=\epsilon}}{z_{i=\epsilon}}\right)^{1/\alpha} + (1-\theta)\left(\frac{2x_{i\neq\epsilon}}{z_{i\neq\epsilon}}\right)^{1/\alpha} + 2\theta\gamma$$

The solution to this problem is

$$\frac{x_{i=\epsilon}}{z_{i=\epsilon}} = m^s(\theta;\gamma) \equiv \frac{1}{2}\left[\frac{\alpha(2-\theta)}{1+\theta\gamma}\right]^{\alpha} < m$$
$$\frac{x_{i\neq\epsilon}}{z_{i\neq\epsilon}} = M^s(\theta;\gamma) \equiv \frac{1}{2}\left[\frac{\alpha(2-\theta)}{1-\theta}\right]^{\alpha} > M$$

With decreasing returns to scale, we have that the supranational regulator still gives lower profits to the foreign firm but not necessarily to the extent that profits become negative. In particular, we have that

$$\Pi_{i\neq\epsilon} = 2 - \frac{\alpha(2-\theta)}{1-\theta}$$

Profits of foreign firms will be positive as if there is enough decreasing return to scale ($\alpha < \frac{2-2\theta}{2-\theta}$). Finally, it is easy to check that since m^s is decreasing in θ and M^s is increasing in θ, the proof of proposition 1 follows through with decreasing returns to scale.

A.3 Externality

In the main text we assume that the designers are politicians, and as such they are biased. We can also consider an externality to create a meaningful tension between the first best and the decentralized equilibrium under perfect competition. We assume that aggregate welfare is the sum of households' direct utility from consumption and leisure plus a term that increases with industry profits

$$W = U + \alpha\Pi_{\eta}$$

where $\eta = 1, 2$ with equal probability. The term $\alpha\Pi_{\eta}$ can have several interpretations, from innovation, increasing returns, and financial distress to political economy. For instance, it is similar to that in Lim and Yurukoglu (2018).[29] Without this externality, it would be trivially optimal to delegate control to a completely independent regulator tasked with enforcing perfect competition. With the externality, on the other hand, there is room for a politician to make a legitimate case for protecting an industry. We introduce randomness (via η) to create value for flexibility, i.e., it is not known in advance which industry really needs

[29]There are several ways to motivate this externality. One is a model of financial distress and inefficient liquidation, where it can be optimal to help an industry, for instance during a financial crisis. Another is a model with incentives to innovate or to invest. Lim and Yurukoglu (2018) study a dynamic investment game between an electricity firm and a regulator subject to time consistency issues, where the regulator puts a weight on customer surplus and a weight on the firm's profits. There is also a political economy interpretation. A government implementing difficult reforms needs to pick its fights carefully. For instance, in France, the national railway company arguably suffers from excessive prices (and wages) but also from excessive pension obligations. It may be too risky to implement the pension reform and the deregulation of services at the same time, however. The exact nature and shape of the externality is not important for our results, as long as it is an increasing function of industry profits.

some (temporary) protection. Of course, politicians have their own agendas and full flexibility is not optimal either. We define

$$\zeta \equiv \Pr(\epsilon = \eta).$$

The parameter ζ denotes the congruence between public interest and politicians' preference ex-post. When $\zeta = 1$, politicians always care about the industry that needs protection. When $\zeta < 1$, they sometimes care about the industry that does not need protection. Aggregate welfare is

$$W(\epsilon, \eta; \theta) = \bar{U}(\theta) + \alpha 1_{\eta=\epsilon} \pi(\bar{m}_\theta).$$

The founding fathers choose θ to maximize

$$V_0 = \max_\theta \mathbb{E}[W(\epsilon, \eta; \theta)] = \bar{U}(\theta) + \alpha\zeta\pi(\bar{m}_\theta)$$

It is easy to see that the optimal choice is to set $\theta\gamma = \alpha\zeta$.

Lemma 5. *In a closed economy (one country), the politicians choose a regulatory framework with influence parameter*

$$\bar{\theta} = \frac{\alpha}{\gamma}\zeta$$

This model is formally equivalent to the model we have used so far if we set $\beta = \frac{\alpha}{\gamma}\zeta$.

A.4 N Countries

We can also extend our analysis to the case of N countries and N goods. For simplicity we normalize the $z_i's$ to 1. Indirect utilities are given by

$$U_i = \sum_{j=1}^{N} \log(x_j) - N x_i$$

and profits are

$$\Pi_i = N(1 - x_i)$$

The regulator therefore maximizes

$$\max_{\{\mu\}} (1-\theta) \sum_{i=1}^{N} U_i + \theta V_\epsilon$$

With probability $1/N$, country 1 gets to influence the regulator. In that case, the regulator solves

$$\max_{\{\mu\}} U_1 + (1-\theta) \sum_{j=2}^{N} U_j + \theta\gamma\Pi_1$$

This is equivalent to maximizing

$$\left(1+\left(N-1\right)\left(1-\theta\right)\right)\sum_{j=1}^{N}\log\left(x_j\right)-Nx_1-N\left(1-\theta\right)\sum_{j=2}^{N}x_j+N\theta\gamma\left(1-x_1\right)$$

The solution is

$$x_1\left(\epsilon=1\right)=m_\theta^N=\frac{1-\frac{N-1}{N}\theta}{1+\theta\gamma}$$
$$x_j\left(\epsilon=1\right)=M_\theta^N=\frac{1-\frac{N-1}{N}\theta}{1-\theta}$$

Country 1's favorite choice of θ at the design stage maximizes

$$\begin{aligned}\mathbb{E}\left[U_1\left(\epsilon,\theta\right)+\beta\Pi_1\left(\epsilon,\theta\right)\right]&=\frac{1}{N}\left(\log\left(m_\theta^N\right)+\left(N-1\right)\log\left(M_\theta^N\right)-Nm_\theta^N+N\beta\left(1-m_\theta^N\right)\right)+\frac{N-1}{N}\left(\log\left(m_\theta^N\right)+\left(N-\right.\right.\\&=\log\left(m_\theta^N\right)+\left(N-1\right)\log\left(M_\theta^N\right)-\left(1+\beta\right)m_\theta^N-\left(N-1\right)\left(1+\beta\right)M_\theta+N\beta\end{aligned}$$

If we abstract first from regulatory over-reach by keeping M_θ^N constant, we see that the optimal choice of m_θ^N would be again $\frac{1}{1+\beta}$. From the functional form of m_θ^N this requires increasing independence as N increases $\theta^{(N)}=\frac{\beta}{\gamma+(1+\beta)\frac{N-1}{N}}$.

If we consider now the full problem, including regulatory over-reach, we see that M is a strictly increasing function of θ. We can thus write $M\left(m\right)$ as a decreasing function and use m as a choice variable. The first order condition is

$$\frac{1}{m}=1+\beta+\left(N-1\right)\frac{\partial M}{\partial m}\left(1+\beta-\frac{1}{M}\right)$$

Since $M>1$, $\frac{\partial M}{\partial m}\left(1+\beta-\frac{1}{M}\right)<0$ and therefore m is larger than $\left(1+\beta\right)^{-1}$. This proves $\theta^{(N)}<\bar{\theta}$. We have

$$\frac{\partial\log m}{\partial\theta}=\frac{-\gamma}{1+\gamma\theta}-\frac{\frac{N-1}{N}}{1-\frac{N-1}{N}\theta}$$

and

$$\frac{\partial\log M}{\partial\theta}=\frac{1}{1-\theta}-\frac{\frac{N-1}{N}}{1-\frac{N-1}{N}\theta}$$

When $\theta=0$ and $m=M=1$, we have $\frac{\partial M}{\partial\theta}=\frac{1}{N}$; $\frac{\partial m}{\partial\theta}=-\gamma-\frac{N-1}{N}$ therefore

$$\frac{\partial M}{\partial m}\left(1\right)=-\frac{1}{N\gamma+N-1}$$

Thus if we estimate at $m=M=1$,

$$1+\beta+\left(N-1\right)\beta\frac{\partial M}{\partial m}\left(1\right)=1+\beta\left(\frac{\gamma}{\gamma+\frac{N-1}{N}}\right)>1$$

Thus $\theta^{(N)}>0$ but decreasing in N. In the limit of large N, we get a finite slope $\beta\left(\frac{\gamma}{\gamma+1}\right)$ starting from the

efficient allocation.

B Antitrust and Regulatory Institutions on both Sides of the Atlantic

B.1 Antitrust Institutions in the US

Antitrust laws are influenced by the evolution of market structures, business practices, and economic analysis. The Sherman Act of 1890 was motivated by the growth of large-scale businesses during the industrial revolution. The Clayton Act of 1914 was the first attempt to deal with anti-competitive mergers and acquisitions. It was motivated by larger mergers that fell outside the purview of the Sherman Act of 1890. The Clayton Act prohibited any company from buying the stock of another company when "the effect of such acquisition may be substantially to lessen competition".[30] In the 1950's the Clayton Act was expanded to include assets as well as stock acquisitions.

The economic understanding of antitrust has also evolved significantly over time, in particular following the Chicago school revolution, which put economic efficiency at the center of antitrust policy, and the influential book by Robert Bork (Bork, 1978). As Kwoka and White (2014) explain "the skepticism and even some hostility toward big business that characterized the initial period of antitrust have been replaced by current policy that evaluates market structure and business practices differently." For instance, high concentration does not necessarily imply market power. These evolutions are reflected in the various vintages of the *Merger Guidelines*, initially developed by the DoJ's Antitrust Division in 1968. Major revisions to the guidelines took place in 1982 and 2010.

At the federal level, the relevant responsibilities are mostly divided between the DoJ Antitrust Division and the Federal Trade Commission (FTC), although some industries, such as railways and Telecoms, also have their own regulators. The FTC is a quasi-judicial, independent regulatory agency led by five commissioners. Each commissioner is nominated by the President, confirmed by the Senate, and serves a seven-year term. The terms are staggered and no more than three commissioners can be from the same political party. The President designates one of the commissioners as the Chairman. The DoJ is part of the executive branch, operating under the US Attorney General. An Assistant Attorney General, nominated by the President and confirmed by the Senate, leads the Antitrust Division. The authorities of the FTC and DoJ can overlap, but in practice they tend focus on particular industries or markets. For example, the DoJ typically investigates mergers in the Financial Services, Telecommunications, and Agricultural Industries, while the FTC typically investigates mergers in the Defense, Pharmaceutical, and Retail Industries. Before opening an investigation, the agencies consult with one another. State Attorney Generals (AGs) and private courts also play a role in antitrust enforcement. State AGs can bring actions to enforce their state's own antitrust laws, either as federal antitrust suits on behalf of individuals residing within their states, or on behalf of the state as a purchaser. Similarly, private plaintiffs may bring civil actions for violations of the federal antitrust laws, with the exception of cartel and mergers (see OECD (2015) for additional details on the interplay between public and private enforcement).

[30] This is from Section 7 of the Clayton Act. A distinctive feature of Section 7 is that it lowered the standard of proof for the anti-competitive effects. Under Section 7, mergers could be forbidden when "the trend to a lessening of competition in a line of commerce was still in its incipiency," whereas the Sherman Act requires proof of extant harm to competition, as explained in Institute (2013). The original Section 7, enacted in 1914, only prohibited the acquisitions of "stock" of one corporation by another corporation, and, by its explicit term, it was not applied to the "assets" acquisitions. As a result, businesses found their ways to evade the prohibition by buying target corporation's assets. Congress amended Section 7 to fix this loophole.

B.2 Antitrust Institutions in Europe

The history of EU antitrust is more recent. In 1957 the Treaty of Rome laid the foundations of European competition policies, building on the Treaty of Paris that established the European Coal and Steel Community (ECSC) in 1951. Article 3(1)(g) of the Treaty of Rome envisions "a system ensuring that competition in the internal market is not distorted". Council Regulation 17 made the enforcement powers effective in 1962, and the EU Commission made its first decision in 1964. This regulation was modernized by regulation 1/2003, which has been effective since May 2004. Articles 101 (ex. 81) of the Treaty of Rome deals with horizontal conduct, vertical restraint, licensing, and joint ventures. Article 102 (ex. 82) deals with the anti-competitive effects of dominant position. Merger regulations were added in 1989. Member states have national competition authorities (NCAs) to deal with cases that have national impact. The European Commissioner for Competition and the Directorate-General for Competition (DG Comp) enforce European competition law in cooperation with the NCAs. DG Comp prepares decisions in three broad areas: antitrust, mergers, and state aid.

An interesting debate – and important for our analysis – concerns the influence of the US on Europe. This debate has evolved in three stages. At first, the common wisdom was that EU laws were direct descendants of US laws. Berger (1998) challenged this view and showed that EU laws also had their own "indigenous" traditions. Since then, scholars have reached a more balanced view. For instance, Leucht and Marquis (2013) study the exchange of ideas between the US and Europe and Leucht (2009) explores how the traditionally protectionist economies of Western Europe agreed on common competition rules. Nonetheless, the overall theme is that ideas and institutions have largely converged across regions.

Some changes in recent years have been more qualitative but nonetheless important. In particular, the 2004 changes made the DG Comp more transparent and more accountable to the public. It also clarified the notion of unilateral effects in a way that resembles the US approach. Foncel et al. (2007) focus on important changes in the new EC Merger Regulation of 2004. At the same time, the role of economists within the DG comp has increased during the 2000's, in particular with the creation of the position of Chief Competition Economist in 2003. The position of EU commissioner for competition is prestigious, attracts high caliber politicians, and benefits from strong public recognition.

B.3 Regulatory Institutions in the US

The US began a long process of economic deregulation in the 1970s which, over the next three decades, would cover the Air (1978), Road (1980) and Rail (1981) transportation industries, Electric Power (1978+), Natural Gas (1978), Banking (1980) and Telecommunications (1996) (OECD, 1999). The process of deregulation was deemed a success, with estimates of price reductions ranging from 30-75% across sectors, in addition to improved product quality and choice (OECD, 1999). In 1999, the OECD noted that the *"United States has been a world leader in regulatory reform for a quarter century. Its reforms and their results helped launch a global reform movement that has brought benefits to many millions of people"*.

The deregulation process was led by the Federal Government, though State and Local governments also have regulatory responsibilities. At the federal level, new laws are written only by congress; but more than

60 executive agencies are authorized to issue subordinate regulations. Indeed, these executive agencies issue thousands of new regulations each year. Federal Regulations are compiled in The Code of Federal Regulations (CFR).

Importantly, economic deregulation did not coincide with a reduction of total regulation. Environmental, health, and safety regulations increased substantially over the same period – and have continued to increase. As of 2017, the CFR spans nearly 180,000 pages following an eight-fold expansion over the past 56 years (Davis, 2017). The substantial rise in the scale and complexity of Federal Regulation has led some authors to argue that excessively complex regulations are increasing barriers to entry.

State and Local government regulation further add to the regulatory burden. It is harder to summarize the scale or growth of such regulation, but the increase has also been significant. Occupational Licensing is an area that has received substantial attention. CEA (2016), for example, show that the share of workers required to obtain a license increased from under 5 percent in the 1950s to over 25 percent in 2008 – in large part because greater prevalence of licensing requirements at the State-level.

B.4 Regulatory Institutions in Europe

As with Antitrust, regulatory reform efforts in the EU are more recent. Some countries (such as the UK) pursued economic deregulation independently as early as 1979. But concerted, EU-wide reform efforts started (on a limited scope) in 1985 with the Single Market Plan, and accelerated in the 2000s with the introduction of the Lisbon Strategy.[31] With regards to product market competition, the Lisbon Strategy aimed *"at opening up product markets to competition in particular by completing the internal market for goods and services, by removing obstacles to competition in Member States and by creating a business environment more conducive to market entry and exit." (Zeitz, 2009)* While the Lisbon Strategy failed in other dimensions, substantial product market reforms were implemented. And today, it is hard to under-state the increase of competitiveness arising from a single market – and for many countries, a single currency (Gilchrist et al., 2017). Indeed, European economies have some of the lowest barriers to trade and foreign investment in the world.

Importantly, EU institutions have only partial oversight over Member State's regulatory environments. The EU can either directly prohibit certain domestic regulations (e.g., prohibition of Golden Shares and price controls in transportation industries), can work with member countries to achieve mutual recognition of restrictions, or can enact case law based on a treaty (e.g., ongoing regulation of State Aid by DG Comp). But beyond that, member states must implement reforms directly. This does not mean, however, that the EU has no influence over reform efforts.

Take the implementation of the Lisbon Strategy, for example. The overall objectives were set jointly by the EU and Member States. From then on, Member States were in charge of implementation, but were also required to submit reports to the European Commission on an on-going basis: the so-called Cardiff Reports from 200-2004, followed by National Reform Programs and implementation reports. The EU used those reports to continuously monitor and disclose progress – including the creation of the Microeconomic

[31] The Lisbon Strategy aimed to make the EU "*the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion*" by 2010 (link).

Reform database (MICREF) which compiled and tracked progress across all states. Indeed, EU and peer pressure were seen as key 'embarrassment tools' available to encourage reform. And, if countries still fail to implement required reforms, the Commission may curtail the allocation of the EU Cohesion Funds. Last, for states in the process of accession, stringent reform requirements are negotiated in advance – as evidenced by the substantial reforms implemented at new EU Member States in Central and Eastern Europe (Jens and Johannes, 2004).

C Additional Results and Discussion

This section presents additional results to support the main body. It is structured into four sub-sections:

- Section C.1 presents additional results contrasting the evolution of competition in the US and Europe
- Section C.3 discusses some additional enforcement trends in the US and Europe
- Section C.4 provides additional tests of the cross-sectional implications of our model, including some results for Antitrust
- Section C.5 presents additional regression results on the Real Effects of Enforcement and Regulation

C.1 Additional Results on the Evolution of Competition in the EU and US

Investment and Tobin's Q. Moving from profits to average Tobin's Q, Figure 22 shows the evolution of Q for the NFC sector in Europe and the US[32] Because some countries do not report the value of non-produced assets (mainly land) for the NFC sector, we report two series for EU Q, one including and one excluding these type of assets. For the series including non-produced assets, we fill-in missing values using those countries that report the corresponding value.[33] As shown, Tobin's Q in the US is near it's 2001 peak and well above it's long run mean. By contrast, EU Q remains well-below the 2001 and 2007 peaks – with a value similar to those of the late 1990s and early 2000s.

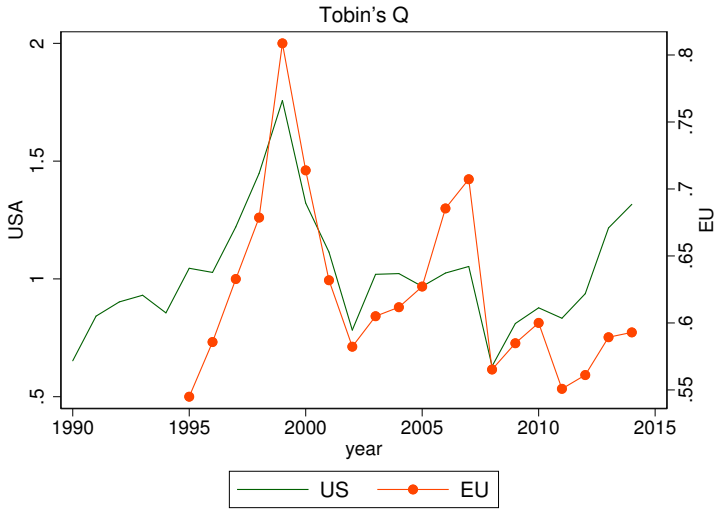
Last, Figure 23 shows that investment is in line with Q in most of Europe, yet remains well-below Q in the US In particular, each plot shows the actual and predicted net investment rate for the NFC sector, where predictions are based on simple time-series regressions. We exclude Spain and Italy from the EU series given the continued effect of the sovereign crisis (investment in these countries remains well-below Q, likely due to financial constraints).

Industries Figure 24 contrasts the evolution of concentration and investment in the Telecom Industry, between the US and Europe.

[32] It is worth noting that EU Q appears to be consistently lower than for US Q. As pointed out by Piketty and Zucman (2014), lower levels are due to mixture of (i) over-estimation of capital; (ii) under-estimation of equity values; and (iii) differences in control rights valuation across countries.

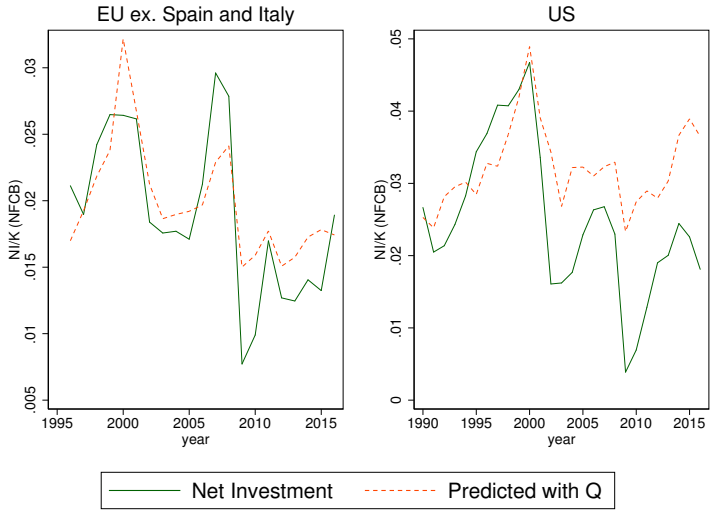
[33] In particular, if a country reports land asset values, we estimate the value of non-produced assets by applying the ratio of non-produced assets to land assets for those countries where data is available. If a country does not report land or other non-produced asset values, we estimate the value of non-produced assets based on the median ratio of produced and non-produced assets for those countries where data is available.

Figure 22: *Q for US and Europe*



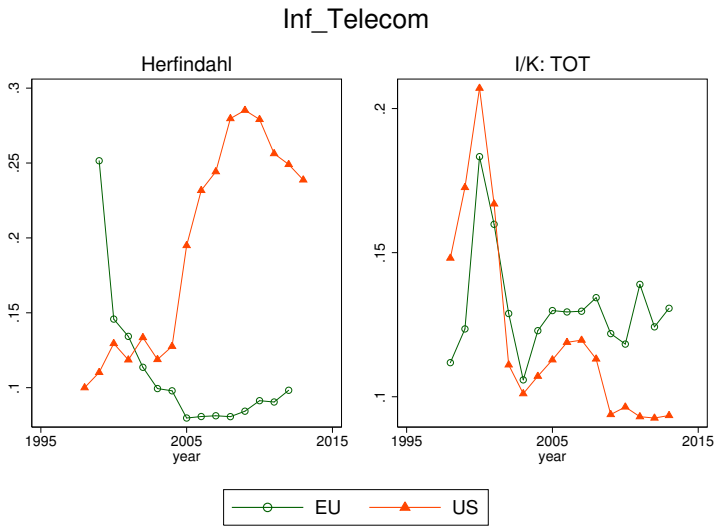
Notes: US data from FRED. EU data from OECD, including all countries for which NFC data was available (these include AUT, BEL, CZE, DEU, ITA, ESP, EST, FIN, FRA, HUN, LTU, LUX, LVA, NLD, SWE). See Dottling et al. (2017) for details on dataset construction.

Figure 23: *NI/K vs. Q for EU ex. Spain and Italy and US*



Notes: Figure shows the actual and predicted net investment rate by for Non-Financial Corporate sector. Predicted series based on a simple time-series regression of net investment on lagged Q from 1996 to 2009 for Europe and 1990 to 2001 for the US. See Dottling et al. (2017) for variable definitions and more detailed analyses that confirm this conclusion.
Sources: US data from FRED. EU data from OECD, including all countries for which NFC data was available except Spain and Italy.

Figure 24: *EU vs US: Telecom*



Notes: Chart compares the evolution of the Herfindahl and investment rate in the Telecom industry for the US and Europe. European series are based on the weighted average across major EU economies. See Gutiérrez and Philippon (2017a) for details.

Figure 25 validates the OECD's broadband price indices by comparing them against an alternate source (Cable.co.uk). While creating such price indices is difficult due to the nuances of broadband offerings across regions (e.g., roaming charges, caps, etc.), the two series yield similar conclusions. In particular, the US exhibits one of the highest prices according to both sources.

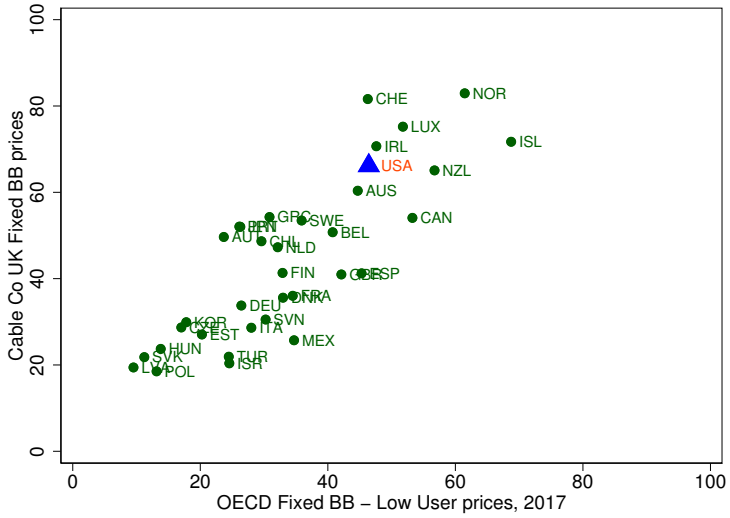
C.2 Robustness tests on Concentration

Figure 26 begins by replicating the bottom chart of Figure 1 with two alternate measures of concentration: the top-8 firm Concentration Ratio and an estimate of the full-economy Herfindahl. The EU figures are based on all firms in Amadeus, which provide a fairly complete coverage for most European economies. US figures are based on US-incorporated firms in Compustat, which provides only partial coverage. We therefore adjust the Compustat figures for the share of total sales captured in Compustat as described in Appendix D. The conclusion is the same: concentration has decreased in Europe while it has increased in the US.

Figure 3 replicates Figure 3 but using the same axis to ease comparison between the US and Europe.

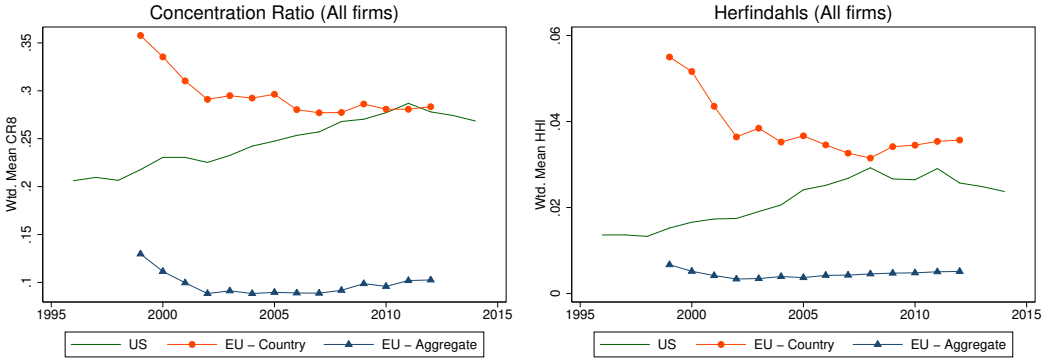
A concern may be that our results are unique to our Amadeus sample and/or Compustat measures of Concentration. However, the same conclusions are reached using alternate data sources and a broader sample of countries. Figure 28 shows the mean HHI for Europe from three alternate sources and populations: KLEMS 2008, the ECB's CompNET and Amadeus. The differences in levels are primarily due to differences in the granularity of segments, though the countries and industries covered by each dataset also

Figure 25: *Two alternate sources of Telecom prices*



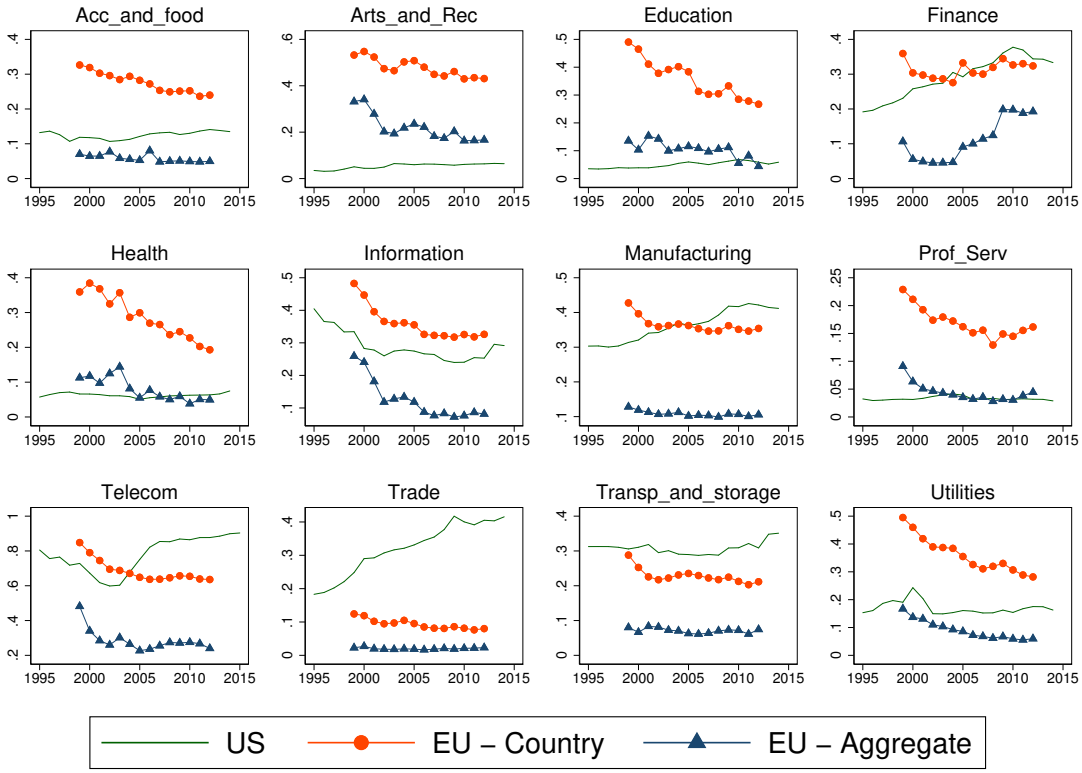
Notes: Chart compares the fixed broadband prices reported by Cable Co UK and the OECD.

Figure 26: *Alternate Concentration Measures: US vs. EU*



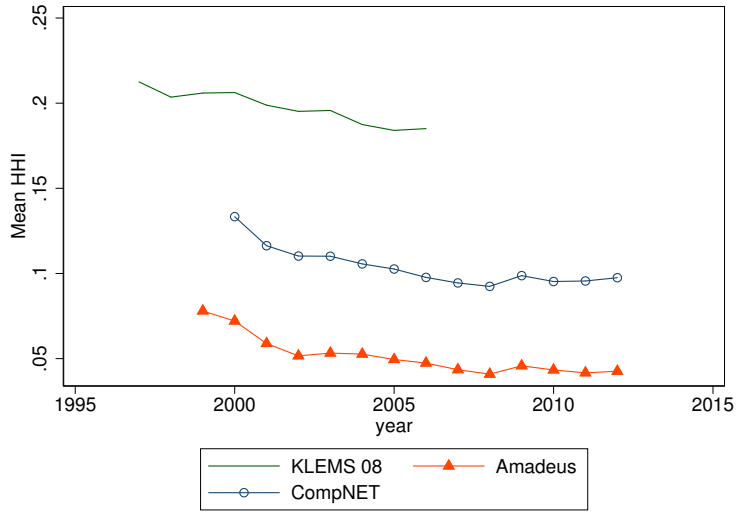
Note: Annual data. US Herfindahls and Concentration ratios from Compustat adjusted for the Compustat share of sales. EU Concentration Ratios and Herfindahls from Amadeus. The sample of EU countries is based on Dottling et al. (2017), and therefore includes only Austria, Belgium, Germany, Spain, Finland, France, Great Britain, Italy, Netherlands and Sweden. Red dotted line shows the weighted average of country-industry concentration measures across Europe (i.e., each country is treated as an independent market). Blue dotted line shows the weighted average of industry concentration measures treating the EU as a single market. Industries follow the EU KLEMS segmentation outlined in Appendix D. Weighted average uses the US-share of sales in each industry and year.

Figure 27: *Mean 8-firm CR by Sector: EU vs US*



Note: Annual data. US Herfindahls and Concentration ratios from Compustat adjusted for the Compustat share of sales. EU Concentration Ratios and Herfindahls from Amadeus. The sample of EU countries is based on Dottling et al. (2017), and therefore includes only Austria, Belgium, Germany, Spain, Finland, France, Great Britain, Italy, Netherlands and Sweden. Red dotted line shows the average of country-industry concentration measures across Europe, within each sector (i.e., each country is treated as an independent market). Blue dotted line shows the average of industry concentration measures within each sector, treating the EU as a single market. Industries follow the EU KLEMS segmentation outlined in Appendix D.

Figure 28: *Mean EU Herfindahl: KLEMS 08, CompNET and Amadeus*



Note: Annual data from KLEMS 2008, Amadeus and the ECBs CompNET. We compute the mean HHI across all countries and industries reported in each database. Similar conclusions reached using the median and weighted average, as well as using concentration ratios (available only for CompNET and Amadeus).

differ.[34] But the trends are very much consistent. Figure 29 shows the corresponding time series by sector, where available.

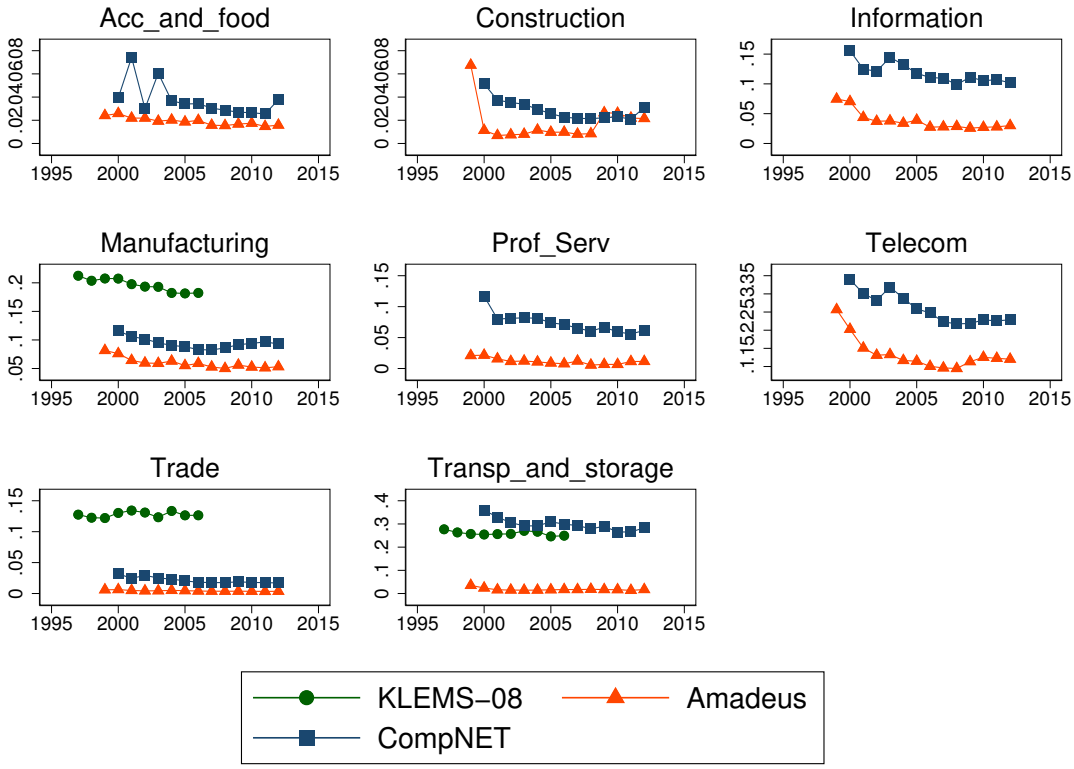
Figures 30 and 31 show similar conclusions for the US using Compustat and the US Census. Again, the levels differ due to differences in segmentation but the trends are very consistent across sources. See also Autor et al. (2017) for a longer time-series of US census-based concentration measures under a consistent segmentation, which exhibit similar trends: concentration begins to increase from 1992 and 1997 for Retail Trade and Services, and between 1997 and 2002 for the remaining sectors.

C.3 Additional Discussion of Enforcement Trends

This section presents more detailed results on Enforcement activity in the US and Europe. Figure 32 shows that the number of formal decisions made by DG Comp on non-merger cases has remained relatively stable since 1964. According to Carree et al. (2010), the early upward trend reflects DG Comp's growing legitimacy and jurisdiction, while the 1990s decrease is due to changes in DG Comp's policies such as the creation of a block exemption regulation system and a stronger reliance on comfort letters instead of official decisions. In addition, around 1989 the DG Comp was burdened with enforcement of the then new merger control regulation. Up until the late 1990s, nearly half of the formal decisions related to exemptions (where the practice is allowed to continue) and negative clearance (where the practice is deemed to be in compliance with regulation). Such decisions essentially disappear in recent years, as the commission resolves nearly all such cases without formal decisions. Focusing on the number of infringements (i.e., actual violations), the number of formal decisions has been essentially flat – or even increased since 2000.

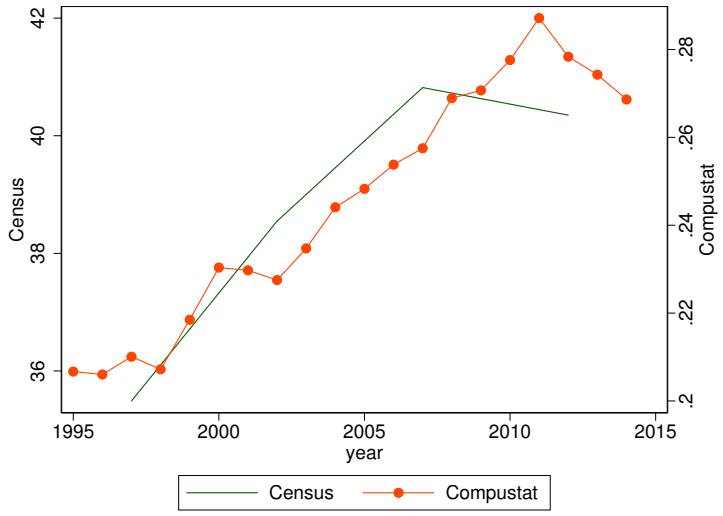
[34] KLEMS 2008 uses the most granular segments (a mixture of ISIC Level 2 and 3) and therefore yields the highest concentration measures. It is followed by CompNET (mostly ISIC Level 2) and Amadeus (mostly a combination of ISIC Level 2 segments).

Figure 29: *Mean EU Herfindahl by Sector: KLEMS 08, CompNET and Amadeus*



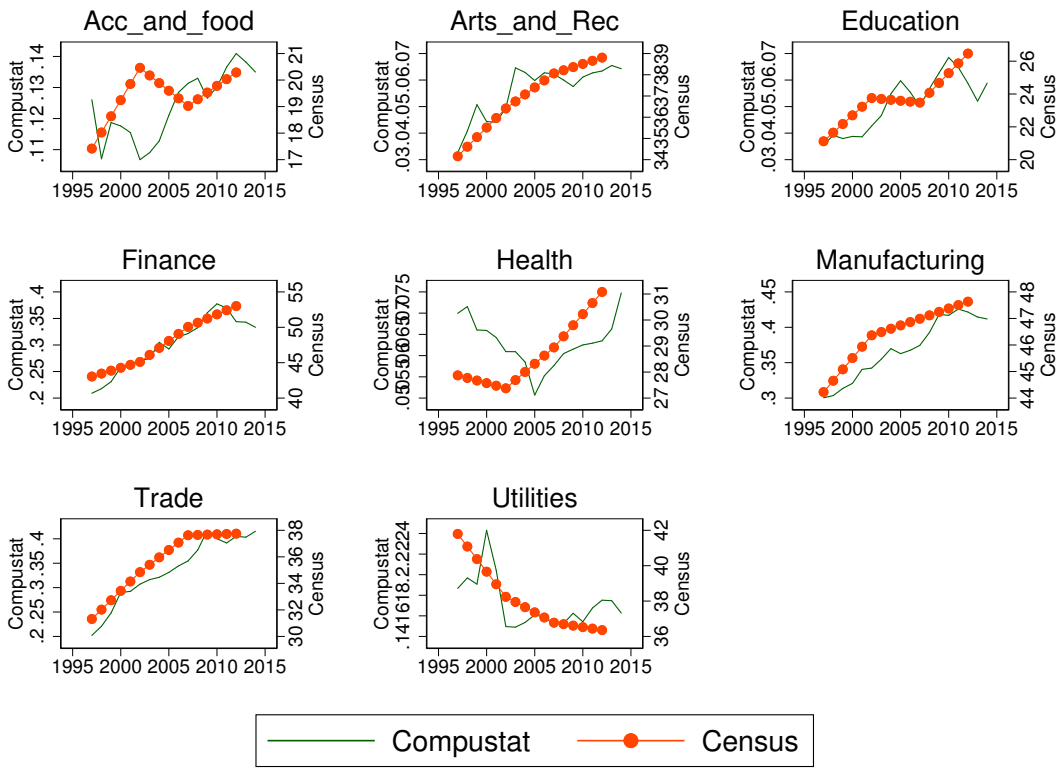
Note: Annual data from KLEMS 2008, Amadeus and the ECBs CompNET. We compute the mean HHI across countries and industries reported in each dataset that belong to each sector, irrespective of differences in segment granularity. Similar conclusions are reached when first aggregating to mirror EU KLEMS segments, and then aggregated to each sector.

Figure 30: *Weighted Average 8-firm CR for the US: Compustat vs. US Census*



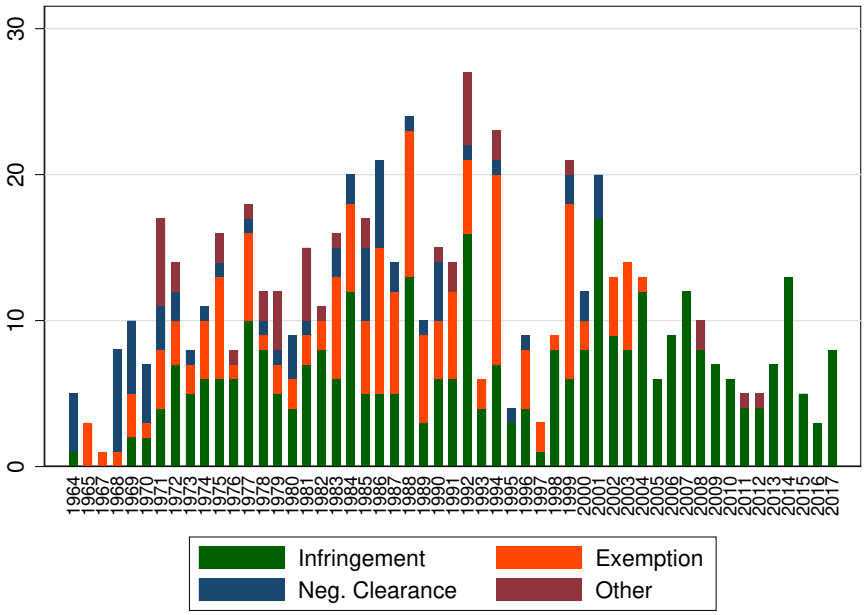
Note: Annual data from Compustat and US Economic Census. Compustat series based on the weighted average CR-4 across EU KLEMS industries (by sales). Census series based on the weighted average of NAICS-5 CRs which appear consistently from 1997 to 2012 (i.e., we exclude industries that experience major revisions either to the NAICS hierarchy or the reporting structure in the Economic Census).

Figure 31: *Mean 8-firm CR by Sector: Compustat vs. US Census*



Note: Annual data from Compustat and US Economic Census. Compustat series based on the weighted average CR-4 (by sales) across EU KLEMS industries that belong to each sector. Census series based on the weighted average of NAICS-5 CRs which appear consistently from 1997 to 2012 and belong to each sector. NAICS-5 industries mapped to KLEMS sectors using the NAICS 2007 to ISIC Rev. 4 Concordance available at link. We omit Information, Telecom, Transportation and Storage and Professional Services. The first three because of major changes to the NAICS hierarchy or reporting structure of Census Concentration Ratios since 2007; and Professional services because Compustat provides limited coverage.

Figure 32: *Number of Formal Decisions taken by DG Comp*



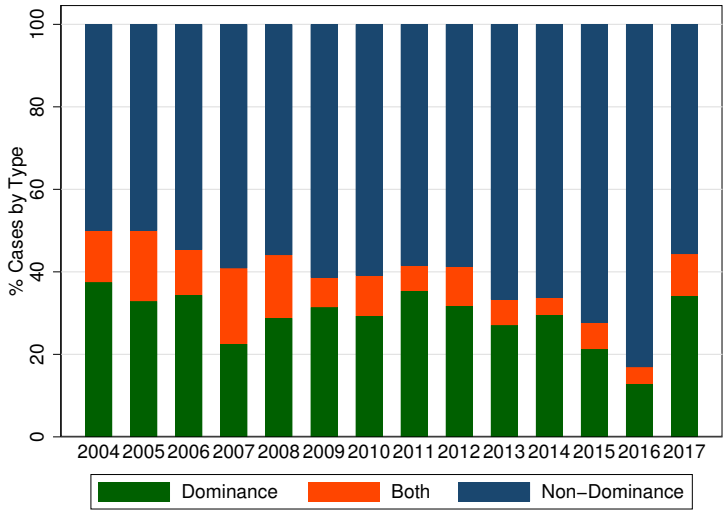
Notes: List of formal decisions from 1964 to 2009 based on Russo et al. (2010), extended through 2017 based on DG Comp's Case Database available at link. Outcomes gathered and mapped manually from DG Comp's website.

Figure 33 shows that Dominance remains an active area of enforcement in Europe not only for DG Comp but also for National Competition Agencies. Indeed nearly 40% of cases since 2004 relate to Abuse of Dominance.

Figure 34 highlights the shift in US Cartel Enforcement towards individuals. The left plot shows that the number of cases has remained relatively stable (thick solid line) despite a declining number of investigations (triangles) and Corporations charged (circles). The reason for this is a shift towards prosecuting individuals (squares). Indeed, the number of corporations charged per investigation has remained stable, yet the number of individuals charged increased drastically since the Financial Crisis (middle plot). This is the result of a policy decision that increased the focus on prosecuting individuals starting in the late 1990s (for example, Hammonds (2001) noted in 2001 that "an individual defendant faces a greater risk of jail time today than even a few years ago").

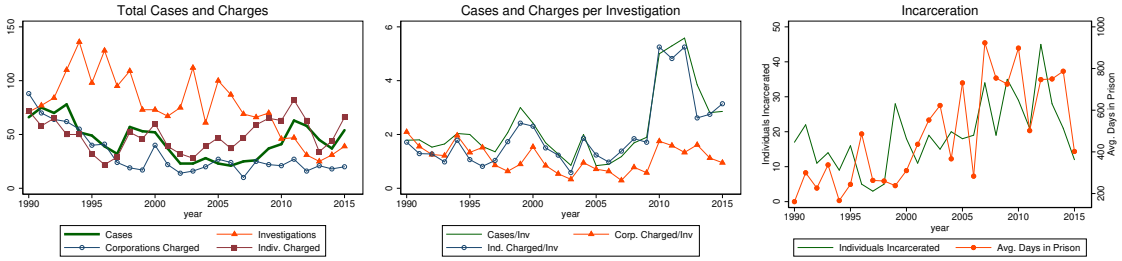
Last, Figure 35 plots the number of cases in the US and Decisions in Europe for Other Restraint of Trade violations. This is generally a less active area than either Cartel or Abuse of Dominance. It includes Joint Ventures, Marketing and Advertising Agreements and Exchange of Information, for example. As shown, There has been a clear decrease in the US. The decrease in Europe is mainly a measurement issue. Many decisions before 2000 were exemptions and negative clearance, which do not constitute violations. Since then, such cases have increasingly been resolved without formal decisions. In fact, DG Comp has resolved even some violations with commitment letters as opposed to formal decisions. Counting both infringements and recent commitment letters on violations (red and blue bars, respectively), EU enforcement has been relatively stable.

Figure 33: *Composition of EU Enforcement (DG Comp + NCAs) by Type of Economic Conduct*



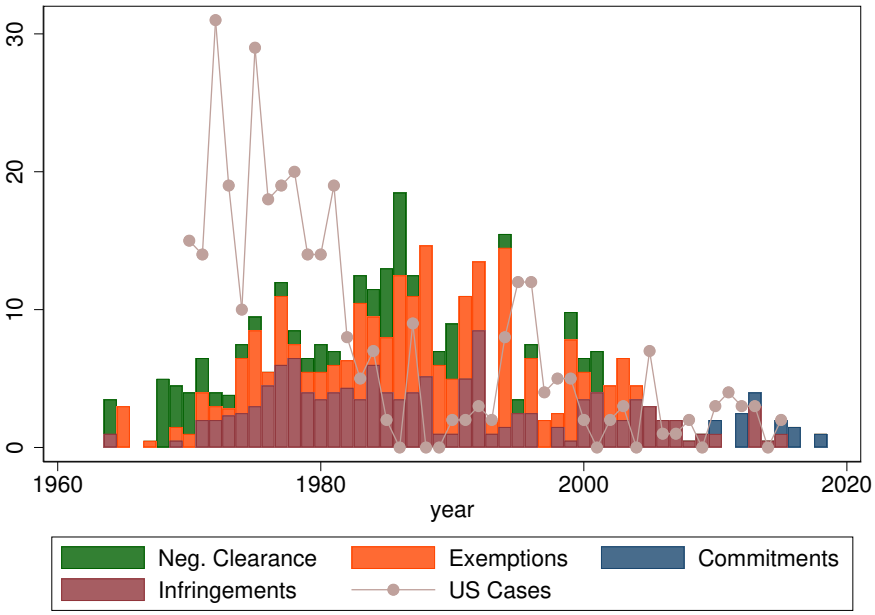
Source: European Competition Network statistics available at link

Figure 34: *Details on US Cartel Enforcement*



Notes: DoJ Annual Reports

Figure 35: *Number of Cases in EU vs. US*



Notes: DoJ Annual Reports for the US. List of formal decisions from 1964 to 2009 based on Russo et al. (2010), extended through 2017 based on DG Comp's Case Database available at link. Outcomes gathered manually from DG Comp's website. Commitments on violations included only after 2009.

C.4 Additional Tests on Cross-sectional Implications

Antitrust. Figure 36 uses responses to the 1996 Eurobarometer survey to show that citizens of countries with weaker institutions (as of that date) had stronger preferences for delegation of Competition Policy to the EU.[35] This suggests that citizens of the corresponding countries realized the benefits from delegation to a more independent supra-national institution.

Figure 37shows the increase in Hylton and Deng's Antitrust policy score from integrating EU law into each country's antitrust law. Countries with initially weaker antitrust policies experience large improvements.

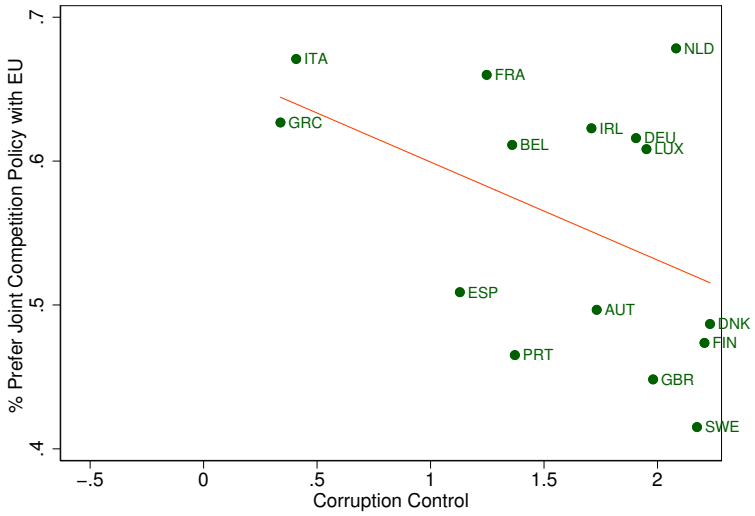
Regulation. Figure 38 shows that countries with initially weaker institutions started with higher levels of PMR in Europe as well as the rest of the world. Since then, PMR indices converged across levels of Corruption Control in the EU, but did not in the rest of the world. Non-EU countries continue to exhibit strong positive relationship between PMR and Corruption Control even in 2013.[36]

Figure 39 plots the reforms implemented by each European country and the US, by sector. As shown, the US implemented about the average number of reforms before 1998, but countries such as Germany and

[35]We use surveys as of 1996 to mirror the timing of institutional design and to mitigate the impact of the crisis on political opinions. We obtain similar results for Consumer Protection and Economic Policy, especially among the EU15. Results including the 12 New Member States that joined after 2004 are less robust for Competition Policy, though these states had little influence on creating the regulator.

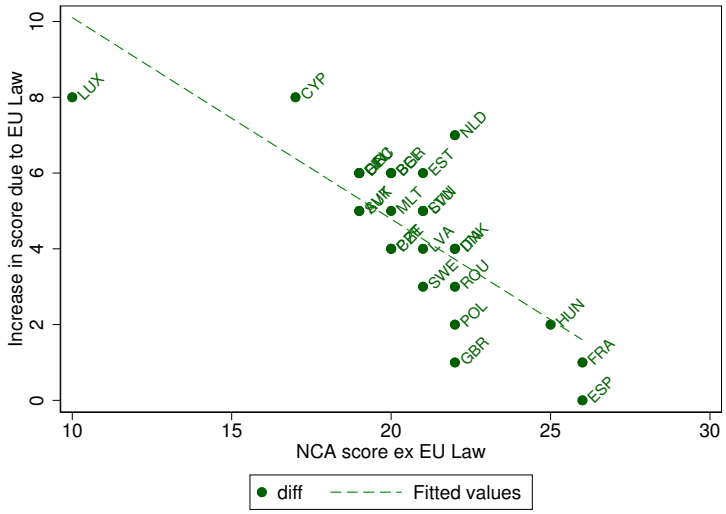
[36]The ending plot includes additional countries which enter the sample. We include all countries in the plot, but note that the relationship is equally strong restricting the sample of countries to those with PMR scores as of 1998

Figure 36: *Preferences for Delegation: Competition Policy*



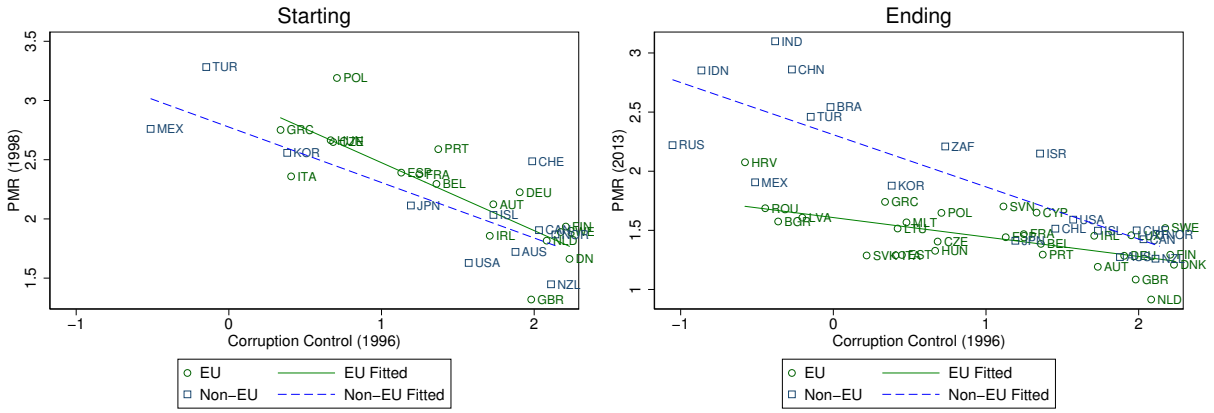
Source: Figure plots the percent of respondents to Eurobarometer 1996 Survey which responded "Jointly within EU" to the question: "For [Competition Policy], do you think that decisions should be made by the (NATIONALITY) government, or made jointly within the European Union?".

Figure 37: *Effect of EU Law Integration on Country Antitrust Scores*



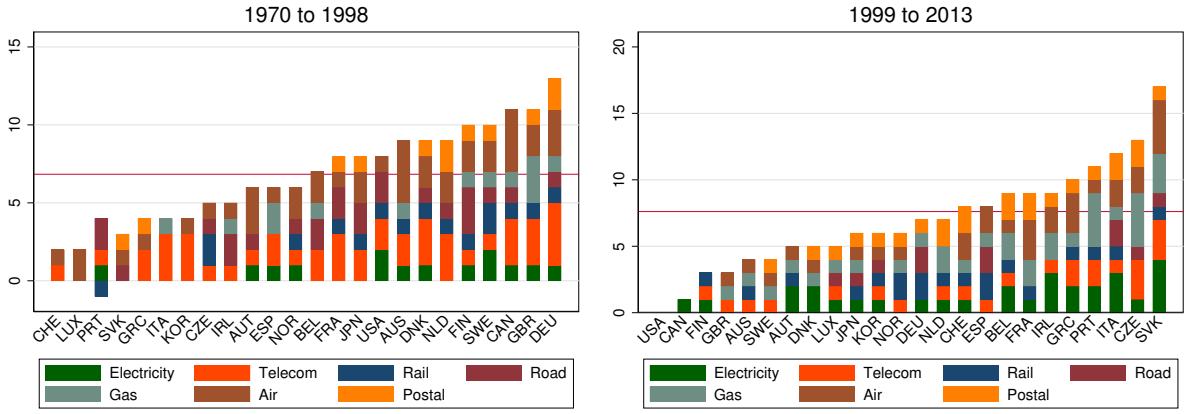
Source: Figure plots the increase in Antitrust Policy score from integration of EU law to Country-specific law, as measured by Hylton and Deng (2006). Updated country scores downloaded manually from link.

Figure 38: *PMR Convergence vs. Corruption Control: Starting and Ending Levels*



Source: Figure shows each country's PMR score as of 1998 and 2013 against the World Bank's measure of Corruption Control as of 1996. The differences in slopes on right panel are statistically significant (t-stat of 3.52).

Figure 39: *Product Market Reforms, US vs EU*

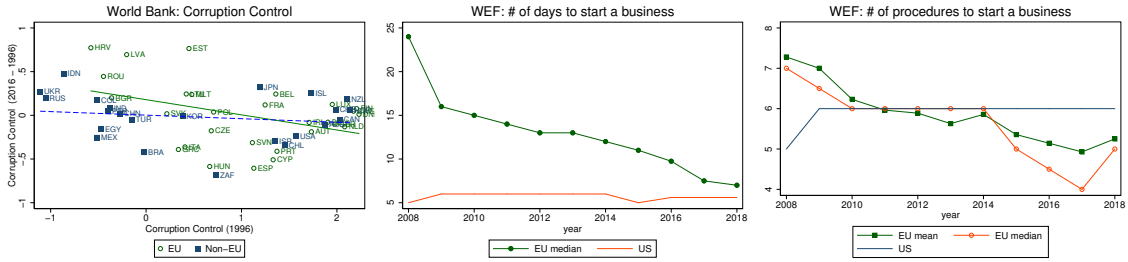


Note: OECD PMR

UK implemented far more. Moreover, these countries continued to implement reforms across a wide range of sectors after 1998, while the US essentially stopped.

Last, Figure 40 reports selected indicators from the World Bank and WEF. The left panel shows that EU countries improved measures of Corruption control faster than non-EU countries (although the differences are not statistically significant).[37] The middle and right panels show that EU countries substantially reduced the time and number of procedures to start a business, with the average and median country being close to or better than the US.

Figure 40: *World Bank and WEF measures*



Source: Left panel shows the change in the World Bank's measure of Corruption Control from 1996 to 2016 against the starting value. Middle (right) panel shows the mean and median number of days (procedures) required to start a business in the EU compared to the US, as measured by the WEF.

Table 4: *Real Effects of PMR*

Table reports regression results of profitability and concentration on the level of PMR, with country and country-industry fixed effects. Measures of profitability from OECD STAN; concentration from Amadeus. Similar results obtained using CompNET. Standard errors clustered at the country-level in brackets. All regressions weighted by country-industry value added from OECD STAN. + p<0.10, * p<0.05, ** p<.01.

	(1) PR_t^c	(2) $PR_t^{c,j}$	(3) $CR8_t^{c,j}$
PMR_{t-2}^c	0.038**	0.032**	0.059*
	(0.013)	(0.008)	(0.025)
Cons	0.128**	0.138**	0.092*
	(0.028)	(0.016)	(0.040)
Year FE	Y	Y	N
Country FE	Y	N	N
Country-Ind FE	N	Y	Y
R^2	0.95	0.93	0.91
N	455	8648	3510

C.5 Real Effects

C.5.1 Regulation

C.5.2 Enforcement

The following tables report more detailed regression results on the Real Effects of enforcement, including separate regressions for merger and non-merger enforcement. In particular, we present

- Table 5: Effects of Enforcement on Concentration: EU Controlling for US
- Table 6: Effects of Enforcement on Profits: EU Controlling for US
- Table 7: Effects of Enforcement on TFP: EU Controlling for US

We almost always find coefficients with the expected sign, which are often statistically significant: enforcement is correlated with decreases in concentration and profitability, and increases in TFP. The main

[37] Similar results are obtained for Government Effectiveness

exception are positive coefficients for concentration on merger cases when including only industry fixed effects. This is likely because merger cases increase with merger waves, which also increases concentration. Indeed, the coefficient turns negative (although not significant) when controlling for merger waves with year fixed effects.

Table 5: *Effects of Enforcement on Concentration: EU Controlling for US*

Table reports panel regression results of the effects of European enforcement activity on changes in concentration, controlling for concentration and enforcement in the US. Columns 1 to 3 include industry fixed effects. Columns 4 to 6 include industry and year fixed effects. Concentration measures from Amadeus for Europe and Compustat for the US. Enforcement activity gathered manually from the DoJ, FTC and DG Comp websites. Industry segments based on EU KLEMS. Standard errors clustered at the industry-level in brackets. + p<0.10, * p<0.05, ** p<.01.

	$\Delta log(CR4)^{EU}_{t-2,t}$					
	(1)	(2)	(3)	(4)	(5)	(6)
$\#Cases^{EU}_{t-2,t}$	-0.015**			-0.009*		
	(0.004)			(0.004)		
$\#Merger^{EU}_{t-2,t}$		0.005			-0.014	
		(0.008)			(0.012)	
$\#NonMerger^{EU}_{t-2,t}$			-0.013**			-0.006
			(0.004)			(0.004)
$\#Cases^{US}_{t-2,t}$	0.005			0.003		
	(0.008)			(0.008)		
$\#Merger^{US}_{t-2,t}$		0.008			0.007	
		(0.010)			(0.011)	
$\#NonMerger^{US}_{t-2,t}$			0.001			0.001
			(0.008)			(0.008)
$\Delta log(CR4)^{US}_{t-2,t}$	0.156	0.151	0.170	0.179	0.165	0.188
	(0.172)	(0.165)	(0.163)	(0.166)	(0.157)	(0.157)
Cons	0.005	-0.046*	0.005	-0.080	-0.137*	-0.089
	(0.035)	(0.019)	(0.022)	(0.078)	(0.066)	(0.066)
Year FE	N	N	N	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y
R^2	0.04	0.01	0.03	0.08	0.08	0.08
N	324	324	324	324	324	324

Table 6: *Effects of Enforcement on Profits: EU Controlling for US*

Table reports panel regression results of the effects of European enforcement activity on changes in profit rates, controlling for concentration and enforcement in the US. Columns 1 to 3 include industry fixed effects. Columns 4 to 6 include industry and year fixed effects. Profit rates from OECD STAN, defined as the ratio of gross operating surplus to gross output. Enforcement activity gathered manually from the DoJ, FTC and DG Comp websites. Industry segments based on EU KLEMS. Standard errors clustered at the industry-level in brackets. + p<0.10, * p<0.05, ** p<.01.

	$\Delta log(PR)^{EU}_{t,t+2}$					
	(1)	(2)	(3)	(4)	(5)	(6)
$\#Cases^{EU}_{t-3,t-1}$	-0.001			-0.003^{+}		
	(0.001)			(0.002)		
$\#Merger^{EU}_{t-3,t-1}$		-0.003			-0.004^{+}	
		(0.002)			(0.002)	
$\#NonMerger^{EU}_{t-3,t-1}$			-0.001			-0.002
			(0.001)			(0.002)
$\#Cases^{US}_{t-3,t-1}$	0.000			-0.001		
	(0.001)			(0.002)		
$\#Merger^{US}_{t-3,t-1}$		-0.000			-0.002	
		(0.001)			(0.003)	
$\#NonMerger^{US}_{t-3,t-1}$			0.001			-0.001
			(0.001)			(0.002)
$\Delta log(PR)^{US}_{t,t+2}$	0.115^{+}	0.115^{+}	0.114^{+}	0.121	0.118	0.119
	(0.069)	(0.069)	(0.069)	(0.073)	(0.072)	(0.072)
Industry FE	N	N	N	Y	Y	Y
R^2	0.07	0.07	0.07	0.07	0.07	0.07
N	389	389	389	389	389	389

Table 7: *Effects of Enforcement on TFP: EU Controlling for US*

Table reports panel regression results of the effects of European enforcement activity on changes in TFP, controlling for concentration and enforcement in the US. Columns 1 to 3 include industry fixed effects. Columns 4 to 6 include industry and year fixed effects. Value added-based TFP growth from EU KLEMS. Enforcement activity gathered manually from the DoJ, FTC and DG Comp websites. Industry segments based on EU KLEMS. Standard errors clustered at the industry-level in brackets. + p<0.10, * p<0.05, ** p<.01.

	$\Delta log(TFP)^{EU}_{t-3,t}$					
	(1)	(2)	(3)	(4)	(5)	(6)
$\#Cases^{EU}_{t-3,t}$	0.002*			0.002*		
	(0.001)			(0.001)		
$\#Merger^{EU}_{t-3,t}$		0.004			0.005+	
		(0.002)			(0.002)	
$\#NonMerger^{EU}_{t-3,t}$			0.002*			0.002*
			(0.001)			(0.001)
$\#Cases^{US}_{t-3,t}$	0.001			0.001		
	(0.001)			(0.001)		
$\#Merger^{US}_{t-3,t}$		0.002			0.002	
		(0.001)			(0.001)	
$\#NonMerger^{US}_{t-3,t}$			0.001			0.001
			(0.001)			(0.001)
$\Delta log(TFP)^{US}_{t-3,t}$	0.278**	0.287**	0.273**	0.266**	0.266**	0.265**
	(0.052)	(0.055)	(0.054)	(0.053)	(0.055)	(0.056)
Cons	-0.023	-0.018+	-0.019	0.001	0.018	0.001
	(0.014)	(0.010)	(0.013)	(0.014)	(0.014)	(0.015)
Year FE	N	N	N	Y	Y	Y
R^2	0.20	0.19	0.19	0.32	0.31	0.31
N	338	338	338	338	338	338

D Data

The data sources used throughout the paper are summarized in Table 8. Items in italics are included in the main analysis dataset used in regression analyses. These include industry-level macro data from OECD STAN and EU KLEMS 2017; concentration measures constructed from Compustat North America (US) and BvD Amadeus (EU); and a compilation of antitrust cases detailing the relevant industry and type of economic conduct by case. We describe the data gathering and mapping exercise for these datasets in the remainder of this section. The data sources in upright text are used to generate the remaining Tables and Figures in the text. The associated data sources and manipulations are fully described in the text.

D.1 EU KLEMS

We start with the September 2017 release of EU KLEMS, available at link. This release covers data for 29 countries – the EU-28 plus the United States. We focus on the output datasets, particularly the value added and value added-implied TFP series.

Data is sourced across all countries as reported, and aggregated to the segments of Dottling et al. (2017) in order to use the corresponding Amadeus concentration series. To be specific, KLEMS data is available at the sector level (19 groups) following the ISIC Rev. 4 hierarchy. Data for some sectors is further broken out (e.g., manufacturing is split into 11 industries), resulting in 34 categories. However, data is not always for the most granular segments (e.g., capital data for segments D45, D46 and D47 is missing for several countries), We consider the most granular segments for which data is available, which includes 31 categories. We then exclude Real Estate (L), Public Administration (O), Households as employers (T) and activities of extra-territorial bodies (U); leaving 27 industry groupings, as summarized in Table 9. Segments listed as 'excluded' are excluded from our analyses. Those with a '0' are captured by other (typically more granular) categories. All other datasets are mapped to these 27 industry groupings.

All nominal quantities are converted to dollars using the OECD's exchange rates, available at link. The main field used is TFP_va_I, which reports a value-added based TFP index equal to 100 in 2010. We compute one-, two-, three- and five-year log-changes; and aggregate across EU countries by taking the weighted average of changes by value added (VA).

D.2 OECD STAN

Our second main source is OECD STAN. We use data from OECD Table STANI4_2016, which follows ISIC Rev. 4 segments. These data are available for 36 countries including the EU-28, the US as well as several other advanced economies (including Australia, Japan, Korea, Canada, Switzerland and Chile). That said, we restrict the sample to the EU plus US in our regression analyses. Both KLEMS and STAN are defined based on ISIC Rev. 4, yet STAN provides more granularity than KLEMS. As a result, we can map STAN to our chosen KLEMS segments directly.

STAN includes measures of production, intermediate inputs, value added, labor costs, (gross and net) operating surplus, employment, and capital. Our main analysis fields include:

- Value added (VALU)

Table 8: *Summary of Data sources*

Type	Source	Main data fields	Granularity
Industry and macro-data	OECD Statistics	GDP, Exchange Rates and NFC financials by Country	Country
	OECD STAN	*Industry Macro-data (Value Added, GOS, Production)*	*ISIC Rev. 4, ∼Level 0 to 2*
US Concentration	*Compustat North America*	*US public firm concentration ratios and HHIs*	*Firm, aggregated to EU KLEMS*
	US Economic Census	US-wide concentration ratios and Herfindahls	NAICS2-6
EU Concentration	*BvD Amadeus (Kalemli-Ozcan et al., 2015)*	*EU concentration ratios and HHIs*	*Firm, aggregated to EU KLEMS*
	ECB's CompNET	Concentration Ratios and HHIs	ISIC Rev. 4, L2
	EU KLEMS 2008	HHIs	ISIC Rev. 3, L2-3
TFP	*EU KLEMS 2017*	*TFP growth*	*ISIC Rev. 4, ∼L2*
PMR indicators	OECD PMR indicators (Koske et al., 2015)		Country and Sector
	Product Market Reform database (Duval et al., 2018)		
Antitrust Indicators	OECD Competition Law & Policy Indicators (Alemani et al., 2013)		Country
	Hylton and Deng Antitrust Indicators (Hylton and Deng, 2006)		Country and region
Enforcement Activity	DoJ Annual Reports	# of investigations, cases, fines, etc. by type of economic conduct	US
	DG Comp Formal Decisions	# of formal decisions (Russo et al., 2010) and associated outcomes (DG Comp website)	EU
	European Competition Network	# and type of cases	EU + NCAs
	DG Comp Cartel statistics	# of cases and fines	EU
Case Databases	*DoJ and FTC Online Case Databases*	*# of cases (by year, type and industry)*	*Case*
	DG Comp Online Case Database		*Case*
US Political Expenditures	Center For Responsive Politics (CRP)	US Federal Lobbying and Campaign Contributions	Contributor
	FollowTheMoney.org	US State Lobbying and Campaign Contributions	Contributor
EU Political Expenditures	LobbyFacts	EU Lobbying expenditures	Contributor
	European Parliament (EU, 2015)	EU Campaign Expenditures for Federal Elections	Country
Other Governance Indicators	World Bank Worldwide Governance Indicators	Country Governance Indicators	Country
	WEF Global Competitiveness Indexes	Country Competitiveness indicators	Country
	EuroBarometer Surveys	Citizen Preferences for Delegation	Country

Table 9: *Summary of Data sources*

KLEMS code	Industry name	Included?	Segment code
TOT	All	0	
MARKT	Market Economy	0	
A	Agriculture	1	D01T03
B	Mining	1	D05T09
C	Mfg	0	
10-12	Mfg_Food	1	D10T12
13-15	Mfg_Textiles	1	D13T15
16-18	Mfg_Wood	1	D16T18
19	Mfg_Petroleum	1	D19
20-21	Mfg_Chemical	1	D20T21
22-23	Mfg_Rubber	1	D22T23
24-25	Mfg_Metal	1	D24T25
26-27	Mfg_Electrical	1	D26T27
28	Mfg_Machinery	1	D28
29-30	Mfg_Transport	1	D29T30
31-33	Mfg_Other	1	D31T33
D-E	Utilities	1	D35T39
F	Construction	1	D41T43
G	Whole_Sale_and_RET_Trade	1	D45T47
45	Trade_motor	0	
46	Whole_Sale_non-motor	0	
47	Retail_nonmotor	0	
H	Transp_and_storage	1	D49T53
49-52	Transp_and_storage	0	
53	Courier	0	
I	Acc_and_food	1	D55T56
J	Inf_and_comp	0	
58-60	Inf_Publishing	1	D58T60
61	Inf_Telecom	1	D61
62-63	Inf_IT	1	D62T63
K	FS	1	D64T66
L	RE	Excluded	D68
M-N	Prof_Serv	1	D69T82
O-U	Com_Serv	0	
O	Public_Adm	Excluded	D84
P	Education	1	D85
Q	Health	1	D86T88
R-S	Arts_and_Rec	0	
R	Arts_and_Rec	1	D90T93
S	Other_Serv	1	D94T96
T	HH	Excluded	D97T98
U	Other_Serv	Excluded	D99

- Production (gross output) at current prices (PROD)
- Gross operating surplus and mixed income (GOS)
- Net operating surplus and mixed income (NOS)

We convert all nominal quantities to US dollars using the OECD's exchange rates, available at link. And then define the profit rate as the ratio of GOS to PROD.[38] We aggregate across EU countries by taking the weighted average (by the corresponding denominator in each ratio).

D.3 BvD Amadeus

Our primary concentration series for Europe are those of Dottling et al. (2017). We present a brief discussion and refer the reader to the corresponding paper for additional details. The concentration series follow the above segmentation, and are based on the merged vintage dataset of Kalemli-Ozcan et al. (2015).[39] They cover the ten major European economies included in the December 2016 KLEMS release (AUT, BEL, DEU, ESP, FIN, FRA, GBR, ITA, NLD and SWE) from 1999 to 2012. They include Herfindahls (sum of squared market shares) and Top 4, 8, 20 and 50 Concentration ratios (share of sales captured by the top 4, 8, 20 and 50 firms) for four populations, following our chosen industry segments:

- Each country and industry separately
- The top 50 firms within each country and industry, separately
- Each industry across all EU countries in the sample (i.e., excluding GBR and SWE)
- The top 50 firms within each industry across all EU countries in the sample (i.e., excluding GBR and SWE)

The top-50 firm concentration measures allow us to mitigate issues with missing/inaccurate data; and to mirror the use of public firms in the US.

D.4 Compustat North America

Our primary US concentration series are based on Compustat North America, which includes all public firms in the US. Data are available from 1950 through 2016, but coverage is fairly thin until the 1970s. We exclude firm-year observations with assets under $1 million, or with missing year, assets, or $gvkey$.[40]

In order to more closely mirror the aggregate and industry figures, we focus on US incorporated firms (see Gutiérrez and Philippon (2017b) for additional discussion). We map firms to our desired segments using the NAICS 2007 to ISIC Rev. 4 concordance available at link. In particular, we first map map each

[38] Most of our results are robust to using net profit rates (OS/PROD or OS/VA). However, depreciation series are often available over shorter periods and can be quite volatile in some segments (see Dottling et al. (2017)) so we focus on Gross Operating Surplus.

[39] We are very grateful to Sebnem Kalemli-Ozcan and Carolina Villegas-Sanchez for their help computing these series

[40] We also interpolate sales from 1999 to 2002 for GVKEY codes 4242,1440,143542 rather than use the reported values because they exhibit extremely sharp growth in reported sales, which result in large jumps in concentration measures.

ISIC Rev. 4 Level 2 segment to a given KLEMS segment. Next, we map each NAICS-6 segment to the most common KLEMS segment (by number of mappings) based on the the concordance. This mapping is one-to-one for 90% of the NAICS-6 segments; and for the remaining segments there is usually a single most common KLEMS segment. For the few cases where NAICS-6 segments map with equal likelihood to more than one KLEMS segment ($\sim$5% of NAICS-6 codes), we follow the same methodology but with NAICS-5 codes (and so on).[41]

Once the firm sample is mapped to our chosen segments, we compute Herfindahls and Top 4, 8, 20 and 50 Concentration ratios. Compustat concentration measures cover only public firms. For some of our robustness, we compute adjusted concentration measures accounting for the Compustat share of sales. In particular, let

$$s_{jt}^{CP} = \frac{\sum_{i \in j} sale_{it}}{gross\, output_{jt}}$$

denote the Compustat share of sales.[42] Then the adjusted concentration ratio is defined as

$$CR_{jt}^{Adj} = CR_{jt} \times s_{jt}^{CP},$$

and the adjusted Herfindahl is

$$HHI_{jt}^{Adj} = HHI_{jt}^{CP} \times \left(s_{jt}^{CP}\right)^2,$$

where the concentration ratio adjustment assumes that public firms are always the top firms; and the HHI adjustment assumes that non-public firms are infinitesimally small and therefore do not contribute to the industry Herfindahl.

D.5 Antitrust Case Database

Last, we compile a database of recent Antitrust enforcement cases for the US and Europe.

DoJ Cases. DoJ cases up to December 2017 were downloaded manually from link. In total, we obtain 349 Civil Merger, 364 Civil Non-Merger, 1,022 Criminal and 117 Other cases. We exclude "Other" cases from our analyses because they are almost always 'briefs' related to other cases, rather than new investigations of violations. Moreover, they do not appear to be counted as cases in the DoJ's annual report: excluding such cases, we confirm that the number of cases reported by the DoJ and compiled in our database roughly match after 1996. The remaining differences are likely due to timing of case opening dates vs. reporting.

[41] In some cases, Compustat NAICS codes contain fewer than six digits. In that case, we repeat the process using NAICS-5 to NAICS-2 codes. Firms with missing NAICS are mapped to the most common NAICS-3 segment among firms that share the same SIC code and have NAICS codes available. Firms that cannot be mapped to an ISIC segment (those with 'other' NAICS code 999 are excluded from industry quantities).

[42] We acknowledge that this is not perfect. Firm Financials in Compustat include output in the US and elsewhere, while national accounts include only US output. Nonetheless, the adjustment is used mainly for robustness tests of concentration series hence will have a limited effect on results.

The DoJ's database is structured around the Case Open date, which we use to define the year of each case. The database includes industry codes, following the hierarchy available in link. Some of these codes are based on SIC hierarchies and some are based on NAICS. We manually review the list and assign each code to a hierarchy. For cases including a NAICS code, we drop the corresponding SIC codes. For cases including only SIC codes, we map the corresponding codes to a NAICS-6 code using the SIC87-to-NAICS02 concordance provided by the Census.[43] If more than one NAICS code is reported (either directly, or because more than one SIC codes are given and they map to different NAICS codes), we keep both.

We then map all NAICS codes to EU KLEMS segments following the methodology used for Compustat. We then follow Feinberg and Reynolds (2010) and drop duplicate cases in the same year, type and KLEMS segment and federal court because they often relate to prosecution of different agents (e.g., the corporation and individuals, or multiple individuals) for the same violation.

; and aggregate the count of cases by year and type of economic conduct. A small number of cases map to more than one KLEMS segment, in which case we adjust the count accordingly (if a case maps to two industries, we count it as half a case for each).

FTC Cases. FTC cases are gathered manually from link. Data was downloaded in January 2018 and includes 404 Merger cases and 175 Non merger cases. It includes a complete set of cases after 1996. We obtain separate lists by "Competition Topic" of Merger and Non Merger; and for separate Announcement Date years. The latter is used to define the year of Case Opening. The FTC provides only broad industry segments that do not align with either NAICS or SIC segments. We therefore manually map the cases to NAICS industries based on the firms involved in the case and the associated description. As for DoJ cases, we map the cases from NAICS to ISIC Rev. 4 segments following the same methodology as for Compustat firms; and then aggregate to our chosen KLEMS segments. Unlike the DoJ, we do not encounter as many repeated cases for the same violations, so we count all observations separately.

EU Case. Last, cases for DG Comp are gathered from link. We download all Antitrust/Cartel and Merger cases in the database, but restrict our analyses to cases starting between 1999 and 2017 – when the database is reported to be complete. There are a total of 264 merger cases and 625 non-merger cases. The database almost always includes NACE_Codes, which can be easily mapped to ISIC Rev.4 segments and the associated KLEMS segments. When codes are not reported, we manually map the case based on the firms involved. We define as the case opening year as the year of the first announcement for the corresponding case in the database. Note that we include all opened cases in the database, irrespective of the type. Some of these cases are sector inquiries, and need not involve specific firms. We nonetheless view these as informative of DG Comp's activity in promoting competition. As for DoJ cases, whenever a particular case maps to more than one industry, we adjust the count of cases by the number of industries to which the case maps. Like the FTC, DG Comp almost always aggregates violations across firms into single cases (in part because it cannot charge individuals) so we count all cases individually.

[43] We map to NAICS-2 because no such concordance is available to NAICS07.

The number of cases by type of economic conduct is then aggregated to our chosen KLEMS segments for analysis.