The Impact of Economic Regulation on Growth: Survey and Synthesis

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Abstract

This study provides a survey of research that uses cross-country comparisons to examine how economic regulation affects growth. Studies in the peer-reviewed literature tend to rely on either World Bank or Organisation for Economic Co-operation and Development measures of regulation. Those studies seem to reflect a consensus that entry regulation and anticompetitive product and labor market regulations are generally harmful to growth. The results from this cross-country research, taken in conjunction with economic theory as well as other country-specific studies of economic regulation, support the hypothesis that economic regulation tends to reduce welfare in competitive markets. Given the continued use of certain types of economic regulation, the findings may offer important lessons for policymakers.

JEL codes: K23, O38, O47

Keywords: regulation, economic growth, productivity, World Bank, Ease of Doing Business index, OECD, product market regulation, employment protection legislation

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1. Introduction

Since the early years of the 21st century, a sizable academic literature has emerged that examines the effects of business regulations on economic growth and productivity. Much of this research uses cross-country indices of regulation from the World Bank or the Organisation for Economic Co-operation and Development (OECD). Among those indices, the World Bank Ease of Doing Business index is perhaps the most popular, having been used in more than 2,000 peer-reviewed academic journal articles and having inspired more than 3,500 reforms (Besley 2015; World Bank Group 2019). Although most of these studies do not focus on regulation and its impact on growth, a significant number do. Yet, to our knowledge, no study has tried to survey and synthesize the body of research emanating from both the Ease of Doing Business index and the OECD indices of product and labor market regulation to explore whether important lessons can be gleaned about the effects of different types of regulation on economic growth. The aim of this paper is to fill this gap in our understanding of the effects of regulation, as well as to identify key areas for future research.

Regulation encompasses many different areas. Hopkins (1998) divides it into three types: (1) economic regulation, which involves restrictions on prices and entry of firms into an established industry; (2) social regulation, which relates to regulation that often involves more than one sector, such as environmental, health, and safety regulation; and (3) process regulation, which involves costly activities associated with permitting and filling out forms, such as tax forms.

In this paper, our focus is on economic regulation, which typically involves regulation of prices and entry into product markets but can also involve terms of employment in labor markets. Specifically, we focus on research that relies on three widely used indicators of regulatory activity: the World Bank Ease of Doing Business index, the OECD Product Market Regulation index (PMR), and the OECD index of Employment Protection Legislation (EPL). Because these datasets have been used in many studies, we limit our focus to the relatively small number of studies that focus on the effect of regulation on growth or productivity. A striking aspect of the current research in this area is how it provides such a clear conclusion about the effects of economic regulation. Most studies point in one direction: they find that economic regulation has negative impacts on growth and productivity.

While increasing GDP is not typically the aim of regulation, we nonetheless believe these findings will be of interest to economists as well as to policymakers. GDP and per capita GDP are widely used measures of economic performance. They may also correlate, albeit imperfectly, with social welfare over the long term.

This paper is organized as follows: section 2 provides an overview of the theory of economic regulation and how it affects competition, technology adoption, and growth. Section 3 explains how we narrow down the universe of studies to select our sample. Section 4 summarizes the studies in our sample. Section 5 discusses measurement and technical issues with this literature. Section 6 concludes and identifies areas for future research.

2. The Theory of Regulation of Competitive Markets

We draw from two intellectual traditions to explain the effect of economic regulation on growth. Public choice theory suggests that regulation can be explained in part by the power of interest

groups in influencing the political process. For example, incumbent firms may advocate for regulation that serves as a barrier to entry, which relaxes pressure on those firms to innovate.

A related literature in economics examines how competition alters incentives to innovate, thereby influencing growth. Entrepreneurs take market share from established firms by discovering more efficient production processes and producing higher-quality final goods. Firms innovate to reduce competition from potential rivals. And labor markets respond to competition by matching labor with the capital that makes it more productive.

Much of the literature on regulation and competition examines regulation in the context of an idealized benchmark of perfect competition. Against such a benchmark, economic regulation is likely to have adverse efficiency impacts, at least in theory. We argue that this theory may be extended to markets that are "workably" competitive, though this benchmark is admittedly harder to define.

2.1. The Political Economy of Regulation

The government's role in creating inefficiencies in markets calls for an explanation in positive terms. In the 1970s, economists began formalizing theories to explain how regulatory agencies might become captured by the industries they are regulating (e.g., Stigler 1971; Peltzman 1976). The idea is that "rent-seeking" businesses will lobby government for regulations that increase their own profits (Tullock 1967; Krueger 1974), such as by erecting barriers to competition. A similar strand of the economics literature finds that politicians benefit from having the power to control entry into particular sectors of the economy (McChesney 1987; Shleifer and Vishny 1993). This is sometimes referred to as the "tollbooth" theory of regulation (Djankov et al. 2002; Djankov 2009).

For a time, there was considerable bipartisan consensus around consumer benefits from deregulation in the United States. Although Republicans tend to be associated with skeptical attitudes toward regulation today, Democrat Jimmy Carter was president when the airline industry was deregulated, and President Bill Clinton signed the law abolishing the Interstate Commerce Commission. Senator Ted Kennedy, supported by now Associate Justice Stephen Breyer, helped bring attention to anticompetitive airline regulations through hearings in the US Senate in the 1970s. And consumer activist Ralph Nader raised public awareness about regulations' impact on consumer prices (Derthick and Quirk 2001).

In more recent years, a similar consensus seems to be emerging among economists surrounding the anticompetitive effects of other types of regulations, most notably occupational licenses and local zoning ordinances (Glaeser and Gyourko 2002; Kleiner and Krueger 2013; Department of the Treasury Office of Economic Policy et al. 2015). In that sense, views on licensing and zoning regulations are similar to the earlier consensus surrounding regulation of trucking and airlines. That is, restrictions in these areas seem to benefit incumbents at the expense of potential new market entrants and consumers.

Such regulations are often defended on public interest grounds by groups that stand to benefit from them financially. For example, physicians will often defend licensing restrictions on nurse practitioners or pharmacists, framing their arguments in public health terms despite the fact that physicians also prefer to limit competition in their industry. When private interests align themselves with publicly interested groups, this is known as the "bootleggers and Baptists" phenomenon, which draws its name from bootleggers and religious interests who both benefited from blue laws banning alcohol sales on Sundays (Yandle 1983).

The results of regulatory reforms from the 1970s through the 1990s have been well documented in the United States as well as in the European context. Winston (1993; 1998) suggests that there were substantial gains from reductions in entry barriers and price regulation in a number of US industries. Gönenç et al. (2001) assesses the effect of regulatory reforms of select industries on economic performance in OECD countries, finding that entry and price liberalization typically point to improved efficiency, enhanced quality, and lower prices for consumers.

Despite this apparent consensus among researchers about its adverse consequences, economic regulation continues to increase in some areas. Although much of the growth of regulation over the past few decades has come in the form of rules related to health and the environment, a sizable amount of healthcare regulation includes the regulation of prices and entry into markets. Certificate-of-need laws establish a government approval process for opening a new healthcare facility or for expanding existing facilities into new types of services. The FDA's costly drug approval process limits entry into pharmaceutical markets. Much environmental regulation involves raising the cost of development through permitting, environmental impact statements, or outright bans.

In other words, much of what appears to be social regulation—because it relates to healthcare provision or the environment—can also be viewed as economic regulation in the form of entry barriers. Financial regulation, which is largely economic regulation, also appears to be increasing since the passage of the 2010 Dodd-Frank Act. In short, despite the knowledge of the anticompetitive effects of regulation that economists have built up over decades, it seems that economic regulation may be increasing in some areas.

2.2. Regulation, Competition, and Growth

There have been a number of attempts to measure losses in static efficiency associated with economic regulation (Litan and Nordhaus 1983; Hahn and Hird 1991; Guasch and Hahn 1999). However, the effect on static efficiency is only part of the picture, and arguably not the most important part, because regulation also influences long-run dynamic efficiency.[1]

One way to measure dynamic efficiency is with an economic growth model.[2] In recent years, a theoretical literature, much of which uses Schumpeterian economic growth models,[3] has emerged. The research connects regulation to the level of competition and economic growth. Aghion et al. (2005) examines product market competition and its relation to innovation and growth. The authors develop a model whereby innovation incentives vary depending on the level of competition and distance from the technological frontier. Similarly, Aghion et al. (2009) finds evidence that the threat of entry increases innovation incentives in frontier firms, as successful innovation allows incumbents to escape competition but discourages innovation in laggard sectors.

Büttner (2006) develops an endogenous R&D growth model in which reducing entry costs by shortening the time span associated with startup procedures increases the steady-state innovation rate and the long-run growth rate. Blanchard and Giavazzi (2003) develop a model of monopolistically competitive firms whereby product and labor market regulation affect the distribution of rents. In the model, product market regulation raises entry costs and reduces competitive pressures on businesses in the goods market, while labor market regulation restricts labor competition and increases the bargaining power of workers.

In theory, employment protections could increase worker effort, commitment, and investment in human capital, thereby increasing productivity growth (Storm and Naastepad

2009; Griffith and Macartney 2013). However, such regulations also increase adjustment costs by impeding the process of labor reallocation after it has become unemployed, thereby leading to productive inefficiencies (Martin and Scarpetta 2012). Labor regulations can also alter incentives to adopt labor-saving technologies, and these incentives are likely to vary depending on the skill level of the workforce (Alesina, Battsti, and Zeira 2018).

In general, the relationship between regulation and the incentive to invest in productivity-enhancing activities is complicated. Competition could in theory result in more or less innovation. Competitive markets may lack profits to invest in innovative activities. On the other hand, innovating is a way for firms to reduce competitive pressures and generate rents. Researchers seem to conclude that the latter effect dominates, such that competition tends to be good for innovation and growth (e.g., Aghion et al. 2001). This finding is consistent with the studies reviewed in this article.

2.3. Applying Insights on Economic Regulation to "Workably Competitive" Industries

According to Joskow and Noll (1981, p. 4), "If economics has any scientifically settled issues, one is surely that price and entry regulation in perfectly competitive industries generates economic inefficiencies." The authors note, "Usually this inefficiency is manifested in higher prices, higher production costs, and slower technological progress than would occur without regulation. In a few instances . . . the inefficiency is created by prices that are too low to clear markets, which leads to inefficient patterns of commodity utilization." A likely motivation for the observation by Joskow and Noll is that a significant amount of economic regulation does not address a market failure and that, without such failures, no regulation is required (Bator 1958).

Although Joskow and Noll use perfect competition as a benchmark, they recognize that this is an idealized market structure. The concept of a competitive market is typically defined as a market where individual economic agents have no control over market prices. Often, such a market includes many sellers, each of whom sells an identical commodity. Price in a competitive market should just cover the average cost of a producer and equal the marginal cost of the last unit sold.

This concept of perfect competition is useful for academic theorizing, but no real-world market is likely to meet such strict criteria. Oligopolistic or monopolistically competitive models may better approximate markets in the real world, and in such cases, it is less clear how regulations affect welfare. However, scholars who have made use of such models sometimes find qualitatively similar conclusions about regulations' effects (e.g., Blanchard and Giavazzi 2003).

The economist J. M. Clark (1940) introduced the concept of "workable competition" to describe imperfect markets that might, for practical purposes, be close enough to competitive to be treated as perfectly competitive.[4] The standard textbook definition of competition need not be present for a market to mimic at least some aspects of the outcomes of a competitive market. In laboratory experiments, for example, Smith (1962) shows that prices consistent with perfect competition can arise in markets with a small number of buyers and sellers. More important than the number of sellers is the absence of collusive behavior and the presence of publicly available information about bids and offers. Contestability, or potential competition, demonstrates how even the threat of competition in the future can be sufficient to lead imperfect markets to produce something approximating competitive market outcomes (Baumol 1982).

One could also define workably competitive industries through examples. Such examples could include (a) industries where entry costs are absent or relatively low, such as in the gig

economy; (b) industries where there is often a high degree of rivalry despite there being few competitors, such as markets for automobiles or soft drinks; or (c) industries that can experience intermodal competition, such as railroads and trucking.[5] In general, workably competitive industries will be defined by low entry barriers. In such industries, the threat of potential competition is likely to be strong and economic regulation is likely to prove counterproductive.

Classic examples of economic regulations that could induce inefficiency are price ceilings set by the government, such as interest rate caps and rent control laws, and quantity limits, such as quotas on imports. Past research on the effects of price and quantity restrictions often tends to focus on particular industries, such as airlines, trucking, and railroads (e.g., Levine 1965; Winston 1993). This body of research led to an academic consensus that may have helped promote deregulation of certain industries. Eventually, two federal agencies that oversaw parts of the transportation sector —the Civil Aeronautics Board and the Interstate Commerce Commission—were abolished in 1985 and 1996, respectively.

In cases where markets are not workably competitive or where other market failures are present (e.g., externalities or information asymmetries), there can be a rationale for economic regulation. In such cases, a quantity restriction or a price cap could be imposed to reduce output to the socially optimal level. The key piece of information that policymakers require is what the efficient price or level of output is. With respect to the transportation-related industries mentioned earlier, there was a consensus among economists that regulations were not serving consumers well. Instead, rules seemed to be written for the benefit of incumbent producers. Empirical analysis can be of assistance to determine whether entry regulations are producing inefficiencies along these lines.

3. Narrowing Down the Universe of Empirical Studies

Several published literature reviews already explore the general effects of regulation on productivity. Djankov (2009) reviews literature that relies on World Bank data, finding a relative consensus that simplified entry procedures improve entrepreneurship and productivity. Entry regulations are associated with lower investment and are thought to impede trade, dulling the productivity benefits associated with an open economy. Crafts (2006) reviews the theory and empirical evidence exploring how regulation of labor and product markets affects productivity performance in OECD countries. The author finds evidence that such regulations reduce the incentive to invest and innovate, thereby reducing productivity growth. Martin and Scarpetta (2012) explore how employment protections impact productivity. The study concludes that employment protection has a sizable negative effect on labor market reallocation, which hinders productivity growth.

Our survey is distinct from these other surveys in several ways. First, we combine the largely disjointed literatures using World Bank data with those using OECD data to ascertain what the overall literature says. Second, we rely on evidence only from studies published in peer-reviewed academic journals, leaving out the many OECD, World Bank, and other working papers that are often cited in these literatures. We believe published studies in peer-reviewed journals may be of higher quality. Third, we compare the studies we review based on their econometric identification strategy, to gain a better understanding of the quality of the studies.

The sample of studies we review relies primarily on three measures of regulation. These are the World Bank Ease of Doing Business index, the OECD Product Market Regulation index, and the OECD Employment Protection Legislation index. The decision to use these indices means that the studies date from roughly the turn of the 21st century, when the databases were

created. We can characterize the sample by whether the relevant studies use OECD data or World Bank data. Among the studies, 17 of 25 (68 percent) use at least one of the OECD indices, 8 of 25 (32 percent) use World Bank Doing Business data as their primary regulation measure, and 7 studies (28 percent) use both the EPL and PMR indices (see table I-1 in appendix I).[6]

The Ease of Doing Business index, launched in 2002, ranks countries' business environments on the basis of a variety of factors, including how hard it is to register property, what the availability of credit to entrepreneurs is, and how adequate contract enforcement is. One criterion in the index that is commonly used as a proxy for the amount of regulation affecting business in a country is the number of steps it takes to start a business. The index also includes the time and costs involved with taking these steps. The landmark study that introduced the Doing Business index, Djankov et al. (2002), reviews entry regulation in 85 countries, finding that countries with heavier regulation of entry have more corruption and larger unofficial economies but not a better quality of public or private goods.

The OECD PMR index began in 1998 and is based on a questionnaire filled out by member countries. It examines two broad categories: the degree of state involvement in business activity and the barriers to entry imposed on domestic and foreign firms. Some variables in the index are tangentially related to regulation, such as the extent of state-owned enterprises or tariff barriers. Other aspects are highly relevant to regulation, including the extent of retail price controls, the stringency of licensing and permitting procedures, and the extent of command-and-control regulation. The index includes measures of regulatory stringency at the sector level in addition to aggregated country-level measures of regulation.

The EPL index evaluates restrictions countries impose on dismissing workers and the procedures involved in hiring workers on temporary contracts. Indicators for the EPL index are

compiled on the basis of the OECD secretariat's reading of statutory laws, collective bargaining agreements, and case law; correspondences with officials from OECD member countries; and advice from country experts.

One study estimates that more than 2,000 peer-reviewed academic journal articles (and 5,000 working papers posted online) have used the World Bank Ease of Doing Business index (Besley 2015). However, the focus of our study is on a much smaller subsample of this literature, which includes 25 studies. The reason for the relatively small sample size is that a surprisingly small fraction of studies in this broader literature explore how regulation affects economic growth or productivity. Moreover, even among the studies that do explore this question, many remain in the form of World Bank or OECD working papers, never subsequently published in externally peer-reviewed academic journal articles.

We obtained our sample by performing searches on Google Scholar and the George Mason University library website, using search terms such as "OECD," "product market regulation," "economic growth," "World Bank," "Doing Business," and "productivity." After collecting initial literature, it became clear that research using the OECD's EPL dataset was also relevant to our study, so we searched for "employment protection legislation" to include studies on the relationship between labor regulation and productivity or growth. Once we began reading the literature, we found other relevant studies in the references of the initial round of collected studies.

We collected 101 studies that touch on regulation and growth, or regulation and some factor relevant to growth, such as investment, productivity, or foreign direct investment.[7] Having collected these studies, we pruned our sample by focusing on published studies in peer-reviewed economics, development, or policy journals. Many of the papers collected were working papers, book chapters, or other reports issued by the OECD or World Bank. Of the remaining studies,

many focused on topics related to growth, such as innovation, but did not directly measure the effect of regulation on growth. By focusing only on those studies measuring the impacts of regulation on economic growth or productivity, we were able to narrow the focus from the approximately 101 studies to the 25 presented here.

Our analysis focuses on cross-country studies rather than on studies looking at specific countries or developing country regions. For example, a burgeoning literature is emerging on how federal regulation in the United States affects growth. We also identified country-specific research focused on the developing world and studies focused on Asian and BRIC countries. We felt that excluding these studies makes our findings more generalizable.

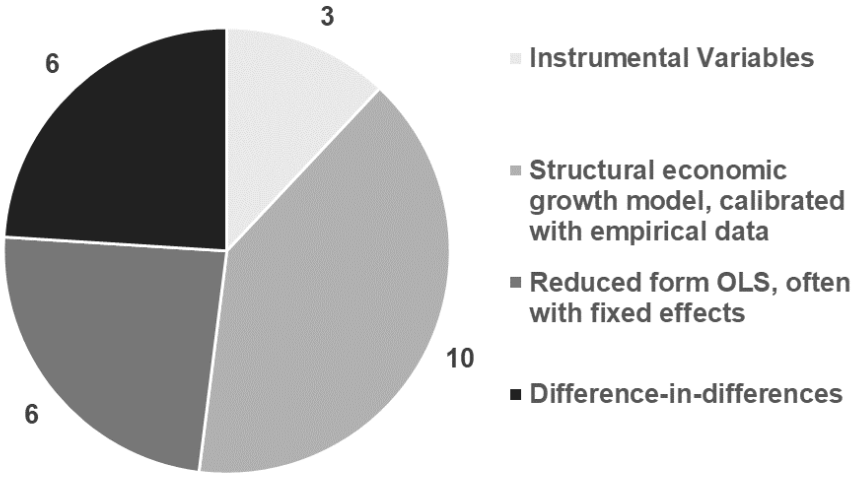
We chose not to include literature that looks at the effects of regulation on entrepreneurship and new firm creation. The body of literature on entrepreneurship is much larger than the one on growth, and we believe that lessons from this literature have been better accounted for than the literature on regulation and growth. We also opted not to include studies focused on innovation efficiency, in part given the heavy reliance of these studies on patent data. We believe patent data to be an imperfect measure of innovation because patents themselves are sometimes viewed as a form of anticompetitive regulation (Boldrin and Levine 2010). Slightly more pertinent to our article are those studies that explore the effect of regulation on investment. For example, Alesina et al. (2005) and Égert (2018) find evidence that regulations are associated with lower investment. However, opening the door to contributors to growth, such as investment, might force us to consider numerous other factors, such as human capital, trade, research and development expenditures, and other topics. Limiting our sample to studies exploring impacts on growth and productivity (which is itself a measure of growth) allowed us to focus narrowly on regulation and its direct impact on measures of economic growth.

Most studies in our sample use panel data across time, although some focus on a single year using country-industry panel data. Six studies rely on cross-sectional, cross-country growth regressions (two of which use instrumental variables). All look at firm, industry, region, or country-level productivity or national growth statistics, such as GDP or GDP per capita. Some studies distinguish between "upstream" and "downstream" industries, whereby downstream industries are typically industries such as manufacturing that use outputs from upstream industries (e.g., energy or transport) as inputs in their own production processes.

Figure 1 provides a breakdown of the studies in our sample by the identification strategy employed in the empirical analysis. Ten out of 25 employ a growth model, either with endogenous growth or a standard neoclassical model. They calibrate the models using data on regulation to identify an impact on growth or productivity (some use models from the literature, while others use an original model). Most of these studies use OECD data. Five studies employ an instrumental variables (IV) identification strategy (which includes two-stage-least-squares approaches), sometimes in conjunction with a structural model or a difference-in-differences strategy. Excluding those studies using IV, six studies employ a purely reduced form strategy, running ordinary least squares (OLS) regressions and controlling for variables of interest, but without relying on a formal multi-equation model of the economy such as a growth model. Many of these studies do control for fixed effects, however. All told, seventeen out of 25 studies control for some form of fixed effects. Many employ an identification strategy pioneered by Rajan and Zingales (1998), which is considered a form of difference-in-differences analysis within the literature. This approach includes a variable for whether regulations are expected to be binding on particular industries or firms, and it exploits variation in country-industry or country-industry-firm panel data. All told, six studies employ a difference-in-differences identification

strategy using the Rajan and Zingales method. They all use OECD data. As mentioned, six studies use cross-sectional data, always with World Bank data and always focused on country growth or productivity as the unit of analysis. The rest of the studies use panel data. The key findings and methods used in the studies in our sample are summarized in table I-1 in appendix I.

Figure 1. Identification Strategies Used in Sample



Note: The instrumental variables count here excludes studies using an instrument in concert with a structural model or a difference-in-differences strategy. Those studies are counted in the other categories.
Source: Authors' calculations.

4. Summary of Sample Studies

This section reviews the results of the studies in our sample. We begin by discussing those studies with direct estimates of regulation on a country's GDP, GDP per capita, or total factor productivity (TFP) growth.[8] We then examine studies that focus on industry and sector-level productivity, and finally we look at those studies focused on firm-level productivity.

4.1. Country or Subnational Region-Level Growth or Productivity

Several studies directly tackle the question of whether regulation affects GDP growth or, similarly, per capita GDP growth. Djankov, McLiesh, and Ramalho (2006) examines 135 countries between 1993 and 2002 and find that countries with a more business-friendly regulatory environment grow faster than those with more burdensome regulatory environments. Improving from the worst quartile of business regulation to the best corresponds with a 2.3 percentage point increase in annual growth. The study relies on OLS regressions with controls for region, human capital, and institutional quality (e.g., corruption), among other variables. The study utilizes a two-stage-least-squares approach as a robustness check.

Haidar (2012), using World Bank data, finds that, on average, each business regulatory reform that makes it easier to start or operate a business, or that otherwise strengthens or more clearly defines property rights, is associated with a 0.15 percent increase in the growth rate of GDP per capita. The study runs cross-country OLS regressions with five years of data and controls for region, institutional quality (e.g., corruption, rule of law), political stability, and other factors.

Barseghyan (2008) studies the effect of entry barriers on productivity and output and finds that an increase in entry costs by 80 percent of income per capita is estimated to decrease TFP and output per worker by 22 percent and 29 percent, respectively. The study calibrates a neoclassical growth model, using cross-sectional data and a two-stage-least-squares instrumental variables identification strategy.

Barseghyan and DiCecio (2011) calibrates a neoclassical growth model with cross-sectional data to study the effect of entry costs on cross-country differences in output per worker and TFP. Countries in the bottom decile of the entry cost distribution have, on average,

about 1.3 times higher TFP and 1.5 times higher output per worker than countries in the top decile. The study finds that a 1.0 percent increase in entry costs is associated with a 0.14 percent decline in TFP.

Freund and Bolaky (2008) runs cross-sectional, cross-country growth regressions to examine the relationship between trade openness, regulation, and per capita income. The authors find greater benefits of trade, in terms of a higher standard of living, in flexible, less regulated economies. Business regulation is a stronger predictor of per capita income gains than is financial development, higher education, or rule of law as a complementary policy to trade liberalization.

Égert and Gal (2017) studies the effects of reforms to labor and product market regulation in OECD countries by calibrating a neoclassical growth model and controlling for country and year fixed effects. The authors find that, of the reforms evaluated, product market reforms have the largest overall single policy effect in terms of raising GDP per capita five years after reforms. However, the combined effect of all labor market reforms together is larger than that of product market regulation alone.

Égert (2016) finds that product market regulations are associated with lower TFP levels in 34 OECD countries over a roughly 30-year period. Running OLS regressions and controlling for country fixed effects in some specifications, the author finds that the effect of product market regulations on TFP may depend on the level of labor market regulations, such that implementing product and labor market reforms together could be more effective than targeting just one form of reform or the other. The author notes that regulatory reform could affect productivity by boosting the effectiveness of R&D expenditures. However, results are not always statistically significant depending on the model specification.

Poschke (2010) calibrates a heterogeneous firm model and finds that small differences in entry costs explain around one-third of the differences in cross-county TFP. The study uses World Bank data on entry costs but focuses on a cross section of 30 OECD countries. The effect seems to operate through higher entry costs reducing competition by reducing the number of firms. Incentives to adopt better technologies are reduced as the market shares of low-productivity firms are preserved.

Moscoso-Boedo and Mukoyama (2012) calibrates an economic growth model using World Bank data to find that raising the level of entry and firing costs from the US level to that of the average of low-income countries raises TFP by 27 to 34 percent. The data come from a cross section of 97 countries.

Using World Bank data, Busse and Groizard (2008) provides evidence that foreign direct investment is less effective at stimulating GDP per capita growth in more regulated economies. The study relies on a cross section of countries but does utilize an instrumental variables approach. Results are driven primarily by the most regulated countries.

Gust and Marquez (2004), using panel data, attempts to explain the productivity divergence that emerged in the 1990s between the United States and other industrial economies. The study runs dynamic OLS regressions, controlling for country fixed effects. Results suggest that the regulatory environment—and regulations affecting labor market practices, in particular—has impeded the adoption of information technologies and slowed labor productivity growth in a number of industrial countries. The findings support a view that has been referred to as the Greenspan-Feldstein argument, namely that to reap high returns associated with information technologies, a firm must be able to reorganize its workforce to align worker-specific skills with technology-specific capital.

D'Costa, Garcilazo, and Martins (2019) explores the effect of nationwide macroeconomic and structural policies on the productivity growth of subnational regions. The authors find that relaxing employment protection legislation on temporary contracts enhances productivity growth in lagging regions, while reducing barriers to entrepreneurship through product market reforms has a positive effect on regions closer to the productivity frontier. The study calibrates a neoclassical growth model, controlling for regional fixed effects.

Two studies in our sample conclude that regulation may boost country-level growth or productivity in certain circumstances. Both focus on employment-related regulation. Belot, Boone, and van Ours (2007) runs cross-country OLS regressions using panel data, controlling for country and time fixed effects. The authors allow for a quadratic effect of employment protection regulation. After constructing their own index of employment protection legislation, the authors find that employment protection legislation has an inverted U-shaped relationship with per capita income growth, whereby low levels of employment protection legislation can stimulate growth, while high levels reduce it.

Storm and Naastepad (2009) finds a positive association between labor regulations and labor productivity growth in 20 OECD countries. Nordic and continental European countries in particular have tightly regulated labor markets combined with strong labor productivity growth. The study runs cross-country OLS regressions, controlling for country fixed effects.

Three studies in our sample explore the effect of regulatory reforms on both country and industry-level productivity. Griffith, Harrison, and Simpson (2010) exploits exogenous variation arising from the rollout of the European Union Single Market Programme to find that product market reforms reduced markups and average profitability among manufacturing firms.

Consistent with an "escape competition" effect, the reforms increased competition and boosted R&D spending, which, in turn, appears to have raised TFP growth.

Conway et al. (2006) calibrates a structural model, controlling for time, industry, and country fixed effects. The authors estimate that if OECD countries aligned regulation of the nonmanufacturing sector with the least restrictive OECD country, the increase in annual aggregate labor productivity growth for the period of 1995–2003 would range between 0.2 and 1.8 percentage points (depending on the initial restrictiveness of the country's regulatory environment) and would hover above 0.75 percent for a number of countries. The authors find evidence that regulations have deleterious effects on productivity through two main channels: their influence on (1) the adoption of information and communications technology and (2) the location decisions of multinational companies.

Cette, Lopez, and Mairesse (2017) calibrates a structural model, running dynamic OLS regressions and controlling for country, industry, and year fixed effects (and their interactions). The study finds that upstream nonmanufacturing regulations reduce downstream industry investment in R&D and in information and communications technology, which lowers productivity. Simulations aggregate these effects to the country level, suggesting that countries that adopt the lightest upstream regulatory regimes could increase national TFP between 1 and 12 percent over 12 years, depending on the country.

The same authors, in a separate study that employs similar methods, find evidence that product and labor market regulations raise production prices and wages, which are signals of market power and reduced competition. The authors conclude that "nearly all countries could expect sizeable gains in [TFP] from deregulation reforms" (Cette, Lopez, and Mairesse 2016, p.

1). Adopting the lightest regulatory practices is expected to increase country-level TFP by about 4.4 percent on average, about 30 percent of which can be expected to be achieved in six years.

4.2. Industry and Sector-Level Studies

Moving on to studies that focus exclusively on productivity at the industry or sector level, Nicoletti and Scarpetta (2003) calibrates a neoclassical growth model, controlling for country, industry, and time fixed effects. The study finds evidence that product market reforms are associated with greater productivity performance in industries in 18 OECD countries. The authors suggest that regulations influence productivity by relaxing competitive pressures, thereby slowing the adoption of best-practice technologies.

Bassanini, Nunziata, and Venn (2009) examine the effect of employment protection legislation on industry TFP in OECD countries from 1982 to 2003. The study focuses on dismissal regulations (or rules that set the conditions for laying off or terminating an employee), using a difference-in-differences estimation strategy and controlling for industry and country-time fixed effects. Results suggest that dismissal regulations related to regular employment reduce TFP as well as labor productivity growth in industries where layoff restrictions are more likely to be binding (which are defined as those industries characterized by high layoff propensity). The authors find no effect of regulations concerning temporary and fixed-term employment. Moreover, labor regulations are found to affect only the long-run rate of technological progress, not the short-run rate of catch-up with the industry frontier.

Bassanni and Venn (2008) employs a similar difference-in-differences identification strategy to Bassanni et al. (2009), finding that employment protection has a modest negative effect on labor productivity and TFP growth in a panel of 60 industries in 18 countries. The

authors find that a one-point increase in the index of employment protection legislation stringency corresponds with a reduction in the annual growth rate of labor productivity of at least 0.02 percentage points and of annual TFP by at least 0.04 percentage points. For comparison, minimum wages and parental leave policies are found to have positive impacts on productivity, and impacts of larger absolute magnitude.

Bourlès et al. (2013) finds that anticompetitive product market regulations in upstream industries curb downstream TFP growth. The study uses a difference-in-differences estimation strategy and controls for industry and country-year fixed effects. If each country aligned its regulations with the most procompetitive regulatory regime in the OECD region, average TFP gains would be nearly 1 percent annually. Effects are more pronounced in industries that are closer to the productivity frontier.

Barone and Cingano (2011) employs a difference-in-differences strategy, controlling for country and industry fixed effects. The authors find that upstream service regulations negatively affect the downstream, service-dependent manufacturing sector in terms of value added, productivity, and export growth. The effect is especially strong with regulation in energy and professional services. Moreover, benefits from lower service regulation increase as market size increases.

4.3. Firm-Level Productivity

The final two studies in our sample examine firm-level productivity. Cingano et al. (2010) utilizes 1.5 million firm-level observations to explore the effect of employment protection legislation on labor productivity, finding that employment regulation lowers investment and labor productivity. Utilizing a difference-in-differences estimation strategy with year, industry,

and country fixed effects, the authors find that effects vary depending on the amount of job reallocation (hiring and firings) within an industry. Reducing employment protection legislation from Greek to Danish levels would raise average value added per worker by 7.1 percent in high-reallocation industries relative to low-reallocation industries.

Finally, Andrews and Cingano (2014) uses a dataset of 1.34 million firm-level observations in 21 OECD countries. The authors find that employment protection legislation and product market regulation are both negatively associated with productivity and that this effect can be explained by adverse effects on allocative efficiency. The study uses a difference-in-differences strategy, controlling for country and industry fixed effects. Robustness checks utilize a two-stage-least-squares instrumental variables approach. The study also runs simulations at the country level, estimating that if entry barriers in each country were lowered to the lowest level in the European Union, this would double allocative efficiency in the entire area and boost labor productivity in the European Union by 15 percent.

5. Discussion of Strengths and Limitations of Research Findings

The outputs of the surveyed literature are not always easy to compare, making a meta-analysis approach difficult. Because many of the studies are calibration exercises, they produce an assessment along the following lines: if a country reduced regulatory burdens to a particular level, such as that of the least regulated country in the sample, then an effect of a certain size could be expected. Remarkably few studies produce a simple estimate of the cumulative or marginal effect of regulation on GDP or GDP per capita growth.

Those studies that do estimate a coefficient effect of regulation on growth produce coefficients of significant economic magnitude. Djankov et al (2006) estimates that countries

with the most business-friendly regulatory environments grow 2.3 percentage points faster than countries with the most burdensome regulatory environments. Haidar (2012) finds that a single business regulatory reform could stimulate a 0.15 percent increase in the growth rate of GDP per capita. And Conway et al. (2006) estimates that aligning regulation of the nonmanufacturing sector with the least restrictive OECD country could increase national labor productivity growth by 0.2 to 1.8 percentage points.

These numbers are also sizable compared to other kinds of policy reforms. Égert and Gal (2017) finds that product market reforms have a larger impact on GDP per capita five years after a reform than a reduction in the tax wedge (which is a measure of the degree to which taxes on labor income discourage employment), in the minimum wage, or in the number of weeks of maternity leave. Bassanni and Venn (2008) finds that employment protection legislation has modest negative effects on productivity but that other labor market policies often have *positive* effects. Although we acknowledge that the impacts found in some studies in our sample are modest, changes of even a few tenths of a percentage point in annual growth could have sizable effects on living standards over time, owing to compounding.

The sampled studies, taken together, are broadly consistent with the conclusion that higher levels of economic regulation—as measured by these cross-country indices of labor, product, and entry regulations—are associated with lower rates of growth of GDP, GDP per capita, TFP, and industry, region, and firm productivity. The microeconomic mechanism connecting economic regulation and growth appears to be that entry barriers reduce competition and, by extension, reduce technology adoption. Much of the research discussed in the previous section is broadly consistent with the theoretical literature discussed above, in which the threat of

entry increases innovation incentives because incumbents' successful innovation allows them to escape competition.

Although the literature discussed in section 4 is largely consistent with economic theory, several issues within this literature should be considered before trying to apply the findings. Potential shortcomings of the sampled literature include problems with the indices used to measure regulation, weaknesses of the statistical tests used to identify a causal effect of regulation on outcome variables such as growth, and publication bias.

Several critiques have been leveled at the indices used to measure regulation in these studies. For example, some scholars argue that the time or number of steps legally required for firms to gain permission to operate does not correspond well with the experiences of firms as reported by business surveys, including the Enterprise Survey conducted by the World Bank (Hallward-Driemeier and Pritchett 2015). The point is well taken, and more work should be done to understand drivers of discrepancies between surveys of businesses and Doing Business metrics.

A related concern is that the ranking scales used in the indices might not adequately capture the extent of regulatory intensity or burden. For example, saying that a country receives a score of 1 on a particular criterion and another receives a score of 5 is not as informative as estimating differences in regulatory costs across jurisdictions. Moreover, some of the indices rely on surveys, which can be subject to human error, bias, or manipulation. We are not suggesting the surveys are necessarily biased; however, numerical rankings are imperfect measures of the degree to which regulations vary in cost or stringency. Nor do they capture the degree to which regulations as implemented might deviate from rules as written on the books, or the degree to which rules are enforced, which is a topic that receives attention in the literature. That said, the data are not totally silent on the stringency of regulations. World Bank data include information

about entry costs, which are an estimate of the time and expense of going through the steps to start a business. These entry costs are generally interpreted as being attributable to regulations, but they could be owing to other factors as well. Even when the index is a simple ranking scale, such a metric may still be superior to alternative measures of regulation (such as page counts).

The World Bank data also include many developing countries, which can bias results without sufficient controls. Developing countries in Latin America and Africa, for example, often have heavy regulatory burdens. Busse and Groizard (2008) and Moscoso-Boedo and Mukoyama (2012) could be cases where developing countries are driving most of the results. That said, many of the sampled studies do control for the region in question, country fixed effects, or institutional quality. A majority of studies in our sample use OECD data, and some studies using World Bank data focus on OECD countries, thereby ameliorating some of the concern that research findings presented here are primarily relevant to the developing world.

Another potential criticism of studies in our sample is that they might be measuring correlation rather than causation. Many studies in our sample employ a strategy whereby a structural model of the economy is calibrated with data to identify the causal effect of regulation on growth or productivity. In general, we believe having a theoretical model to underpin an empirical identification strategy is desirable. Studies using OECD data are more likely to have such a model than those using World Bank data, perhaps because the OECD dataset can be disaggregated at a sectoral level. Several studies in our sample incorporate a difference-in-differences estimation strategy. Many also provide extensive robustness checks (e.g., Bassanini et al. 2009; Barone and Cingano 2011; Andrews and Cingano 2014).

Some studies that rely on simple OLS regression might not control adequately for confounding factors or omitted variables. Many of these studies do control for country, industry,

or time fixed effects. Some use an instrumental variables or two-stage-least-squares approach. However, it is a concern that six out of eight studies using World Bank data run the kinds of simple, cross-sectional, cross-country growth regressions that were widely used in the 1990s.

There is growing recognition of the need to do careful experimentation in the area of regulation to better understand its economic effects (Greenstone 2009). Going forward, a better approach might be to use natural experiments or randomized controlled trials, which allow for more precise identification of causal impacts. Studies like Griffith, Harrison, and Simpson (2010), which exploits exogenous variation in the rollout of the EU Single Market Programme, offer a potential path forward. No doubt, other EU programs or US federal programs rolled out across the 50 states offer similar opportunities. The difference-in-differences identification strategy associated with Rajan and Zingales (1998) is another promising approach.

Both the OECD and World Bank datasets now have decades of data. Researchers can therefore conduct before-and-after event studies or devise quasi-natural experiments in some cases. These approaches have their strengths and limitations. In particular, issues of external validity, which consider whether the findings of research can be generalized, are often highly subjective. It is hard to find clean experiments when dealing with a macroeconomic variable such as countrywide growth. Even if empirical approaches improve, identifying a causal effect of regulation on measured GDP is not the same as identifying an effect on social welfare or economic efficiency.

Another issue relates to publication bias. It might be the case that authors are more likely to report a statistically significant result than a null result, which could explain why this literature appears one-sided. A variety of other factors could also influence whether null findings are reported, such as prevailing biases among researchers. Despite this potential bias, we observe a

few instances of the reporting of null effects and some positive effects as well. Nicoletti and Scarpetta (2003) finds no long-run effects of entry regulation in services industries. Storm and Naastepad (2009) find a positive effect of employment protections on GDP per capita. Belot, Boone, and van Ours (2007) find positive effects of low levels of employment protection (but not high levels).

The issues identified here weaken our general conclusion somewhat, but there is little reason to believe they invalidate it. Instead, the potential problems with these studies provide insights into ways in which future research can help shore up some gaps in existing knowledge. Despite the limitations, the rather one-sided nature of the conclusions of this literature remains striking. Before the year 2000, almost no research looked across countries at the effects of regulation on growth. We now know considerably more than we did then.

6. Conclusion and Areas for Future Research

About 40 years ago, Joskow and Noll (1981) suggested that economic regulation generally reduces economic welfare in perfectly competitive markets. We believe that a less strict version of this statement also holds, namely that economic regulation reduces welfare in real-world markets that might not meet the theoretical test of perfect competition but nonetheless are workably competitive in the sense that firms are rivalrous and barriers to entry are low.

We examined the peer-reviewed academic research on economic regulation that uses cross-country indices of regulation to assess the effect of regulation on growth. We find that economic regulation likely operates by restricting competition, limiting incentives to invest in productivity-enhancing technologies, and, in the aggregate, reducing growth. Such regulation also constrains the ability of firms and workers to match human capital with the physical capital

that makes it most productive, although it may also be the case that a base amount of protection encourages worker effort and investment in human capital.

We noted some strengths and weaknesses of the indices used in these studies, as well as the strengths and weaknesses of the identification strategies that were relied upon. Weaknesses notwithstanding, a striking finding of this research is the apparent consensus that entry regulation and regulation of product and labor markets are generally harmful to growth, productivity, and business activity.

Although the cross-country indices of regulation have less to say about social regulation than economic regulation, they are not totally silent since economic and social regulations are not mutually exclusive. Many regulations related to healthcare provision, for example, have an economic component, as do many environmental regulations. Nevertheless, more research is required to better understand the consequences of social regulation on growth, especially since social regulation appears to have become more prominent in the United States and perhaps elsewhere as well.

A message for policymakers on the basis of this review is to be very cautious about introducing or adding economic regulation into the economy. Although economic regulation is difficult to measure precisely, it might be on the rise after a period of relative dormancy. Since the global financial crisis in 2008 and the passage of the 2010 Dodd-Frank Act, financial regulation seems to be making a comeback in the United States. The Affordable Care Act of 2010 has also led to heightened restrictions on the terms of service and pricing of health insurance contracts, which are forms of economic regulation.

We believe the burden of proof should be on policymakers to show that such regulation is likely to do more good than harm, thus passing a broadly defined benefit-cost test. By broadly

defined, we mean benefit-cost analysis that accounts for the dynamic, as well as the static, aspects of efficiency. In general, benefit-cost analysts should strive to better incorporate impacts on investment and productivity (and corresponding influences on growth and macroeconomic dynamism) into their analysis. A productive next step for developing new insights would be to use experimental approaches that are better suited for identifying causal effects, including comparing impacts of regulation to those of other known drivers of economic growth.

Economists have long known about the likely negative impacts of price and entry regulation on economic activity. The contribution of this article is to show that the cross-country literature on the effects of economic regulation on productivity provides further support for the hypothesis that such regulation adversely affects growth.

Endnotes

1. Without dynamic efficiency, markets that are efficient in the static sense will still misallocate resources away from their most highly valued uses. In other words, dynamic efficiency is a necessary precondition for a static-efficient outcome to represent a globally efficient outcome.

2. Economic growth models can be useful in describing the connection between output, efficiency, and social welfare. For example, many economic growth models incorporate a social welfare function so that the optimal growth path in the model is the welfare-maximizing path. In such models, the dynamically efficient path is the rate of growth that maximizes the flow of consumption (market and nonmarket) produced by the stock of society's human, natural, and physical capital.

3. Schumpeterian growth models, also known as creative destruction models, assume that new innovations replace, or "destroy," old products and modes of production and that this process of destruction is a critical part of the growth process. See, for example, Aghion and Howitt (1992) and Broughel (2017).

4. No precise, agreed-upon definition of workable competition exists, though definitions tend to be similar. Jesse Markham has written, "An industry may be judged to be workably competitive when . . . there is no clearly indicated change that can be effected through public policy measures that would result in greater social gains than social losses" (Markham 1950, p. 361). David Chessler has written, "The concept of 'workable competition' has two aspects: . . . (1) the behavioral and structural characteristics of pure competition (as defined by economists) might not be met, but that the deviations may still be of little economic consequence. The second is that, (2) even where the deviations from competitive behavior and market structure do have significant economic consequences, there may be other economic benefits derived from the behaviors or structures that are of such benefit to society that they outweigh the losses stemming from the anticompetitive behavior and structures" (Chessler 1996, p. 7).

5. We realize we are generalizing, and we do not mean to suggest that these industries are always workably competitive. The degree of competition needs to be assessed on a case-by-case basis.

6. Griffith, Harrison, and Simpson (2010) uses data from the 1988 Cecchini report on EU Single Market Programme implementation. Because the study focuses on EU product market reforms in OECD countries, we count it as using OECD data. Belot, Boone, and van Ours (2007) constructs a unique employment protection index but also uses the OECD EPL index and focuses on OECD countries, so we count their study as OECD.

7. A list of the studies initially collected, as well as reasons for excluding some from the core sample, is available as a supplemental file to this article.

8. Throughout this paper, we have opted to use the term "total factor productivity" instead of "multifactor productivity," the latter of which is the more common parlance in the OECD

literature. Both terms refer to the residual in a growth accounting regression, and the terms are used interchangeably in the literature. For example, Nicoletti and Scarpetta (2003, p. 16) states, “Note that multifactor productivity is also known as total factor productivity.”

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Appendix I: Sample Studies

Table I-1. Studies Reviewed

Study	Regulation Measure	Sample	Unit of Analysis	Identification Strategy	Finding
Nicoletti and Scarpetta (2003)	OECD PMR	23 industries in 18 OECD countries, 1984–1998; regulation data from 1998	Industry/Sector	Calibrated structural model (standard TFP growth equation), controlling for country, industry, and time fixed effects; country fixed effects dropped in some specifications	Liberalization of product markets predicts improved TFP performance; no long-run effects of regulation in services are found.
Gust and Marquez (2004)	OECD EPL (also uses IMD and World Economic Forum regulation data)	13 developed countries, 1992–1999	Country	OLS (with lagged values of some variables), controlling for country fixed effects	Employment protection legislation negatively affects IT expenditures, which impedes technology adoption and slows labor productivity growth.
Conway et al. (2006)	OECD PMR	21 OECD countries and 20 sectors; years are 1978–2003, 1981–2003, or 1995–2003, depending on model specification	Country and Industry/Sector	Calibrated labor productivity model (based on work of Aghion and Howitt), with controls for time, industry, and country fixed effects	Product market regulations predict lower aggregate labor productivity performance, apparently through slower adoption of ICT and location decisions of multinationals. Effect of regulation is significant when focused on IT-intensive sectors but insignificant across a broader sample of industries.

(continued on next page)

Djankov, McLiesh, and Ramalho (2006)	World Bank	135 countries, 1993–2002	Country	OLS regressions with controls for region, human capital, civil conflict, and institutional quality; two-stage-least-squares used as a robustness check	Lighter business regulation environment is associated with faster growth. The countries with the least regulated business environments grow 2.3 percentage points faster annually than the countries with the most regulated business environments.
Belot, Boone, and van Ours (2007)	OECD EPL; regressions use an index of employment regulation constructed by the authors	17 OECD countries, three time periods (1960–1964, 1980–1984, 1995–1999)	Country	OLS, controlling for country and time fixed effects, model allows for quadratic effect of EPL; authors introduce a model of the employment relationship to explain the quadratic effect found	"At low levels of employment protection an increase in protection stimulates growth; at high levels of employment protection an increase in protection is harmful to growth" (p. 394).
Barseghyan (2008)	World Bank	Up to 153 countries (sample sizes varied in regressions owing to data availability)	Country	Calibrated neoclassical growth model, using cross-sectional data, with instrumental variables (two-stage-least-squares); robustness checks use human capital, corruption, and the Heritage Foundation's business regulation index as endogenous regressors	Higher entry costs are estimated to reduce TFP and output per worker. An increase in entry costs by 80 percent of income per capita decreases TFP and output per worker by 22 percent and 29 percent, respectively
Bassanni and Venn (2008)	OECD EPL and PMR (PMR used as a control)	60 industries in 18 countries, 1982–2003	Industry/Sector	Difference-in-differences, controlling for country, industry, year (and their interactions) fixed effects.	EPL has a modest negative effect on labor productivity and TFP. A one-point increase in the index of EPL stringency corresponds with a reduction in the annual growth rate of labor productivity of at least 0.02 percentage points, and in the annual growth rate of TFP by at least 0.04 percentage points.

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Busse and Groizard (2008)	World Bank	84 countries (75 when human capital controls are included); regulation data from 2003; growth data from 1984 to 2003	Country	OLS cross-sectional, cross-country growth regressions, with instrumental variables; controls for human capital and rule of law	FDI inflows do not stimulate growth in economies with excessive business and labor regulations; results are driven by the 20 or 30 percent most regulated countries (for which a dummy variable is used as the regulation measure).
Freund and Bolaky (2008)	World Bank	126 countries, but sample size varies by regression; regulation data is from 2003 and 2004; growth measured from 2000 to 2005	Country	OLS cross-sectional, cross-country growth regression	Moderately regulated countries have higher per capita incomes; benefits of light regulation are larger in more open economies.
Bassanini, Nunziata, and Venn (2009)	OECD EPL	19 industries in 11 OECD countries, 1982–2003	Industry/Sector	Difference-in-differences estimation strategy, with industry and country-time fixed effects	Mandatory regulations governing dismissal terms for regular employment depress labor and TFP growth; no effect is found for regulation of temporary employment contracts.
Storm and Naastepad (2009)	OECD EPL, along with another labor market regulation indicator constructed by the authors using factor analysis	20 OECD countries, 1984–2004	Country	OLS, controlling for country fixed effects	Labor regulations correspond with higher labor productivity growth. Nordic and continental European countries experience high labor productivity growth while also having tightly regulated labor markets. Capital intensity growth is the main factor explaining the positive association between regulation and labor productivity growth.

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Cingano, Leonardi, Messina, and Pica (2010)	OECD EPL	14 OECD countries, 1997–2003	Firm	Difference-in-differences, with year, industry-year, country-year, and firm fixed effects (depending on the regression)	The marginal effect of reducing EPL by one index unit is to increase value added per worker by 3 to 5 percent in most industries in the job reallocation distribution, and by as much as 7 percent in high-reallocation industries.
Griffith, Harrison, and Simpson (2010)	1988 Cecchini report on Single Market Programme implementation	12 manufacturing industries in 9 countries, 1987–2000	Country and Industry/Sector	Two-stage instrumental variables approach, controlling for country, industry, and year or country-year and industry-year fixed effects (depending on the regression); exploits exogenous variation arising from the rollout of the EU Single Market Programme	Product market reforms reduced markups and average profitability in the manufacturing sector; increased competition; increased R&D spending; and increased TFP growth.
Poschke (2010)	World Bank	30 OECD countries; regulation data are from Djankov et al. (2002); data sources come from a variety of years spanning the 1990s and 2000s	Country	Calibrated heterogeneous firm model with cross-sectional data	Imposing entry costs of 30 percent of GDP per capita (roughly the level of Germany and the EU average) in the model explains around one-third of TFP differences between US and Euro-area economies.
Barone and Cingano (2011)	OECD PMR and EPL	15 manufacturing industries in 17 OECD countries, 1996–2002	Industry/Sector	Difference-in-differences estimation strategy, with country and industry fixed effects	Upstream service regulation lowers growth rates of productivity, value added, and exports in downstream service-dependent manufacturing industries.

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Barseghyan and DiCecio (2011)	World Bank	128 countries (sample size varies depending on model specification); regulation data from 2004 to 2008; growth data from 2000, with 1996 and 2003 used as robustness checks	Country	Calibrated neoclassical growth model, with cross-sectional data	Higher entry costs are associated with lower TFP and output per worker. A 1.0 percent increase in entry costs is associated with a 0.14 percent decline in TFP.
Haidar (2012)	World Bank	172 countries, 2006–2010	Country	OLS, with controls for region, institutional quality, and other factors	Each positive regulatory reform is associated with an increase in the GDP per capita growth rate of 0.15 percent on average.
Moscoso-Boedo and Mukoyama (2012)	World Bank	2008 World Bank data, 97 countries broken into four tiers (high income, upper middle income, lower middle income, and low income)	Country	Calibrated economic growth model, with cross-sectional data; two models are used; one assumes output produced with labor as the only input, whereas the second incorporates the capital stock	A country moving its level of entry and firing costs from the US level to that of the average of low-income countries reduces TFP by 27 to 34 percent, depending on the model.
Bourlès et al. (2013)	OECD PMR (NMR)	15 OECD countries and 20 industries, 1985–2007	Industry/Sector	Difference-in-differences estimation strategy, controlling for industry and country-year fixed effects	Anticompetitive upstream product market regulations lower TFP growth in downstream industries. Aligning regulations with the most competitive in the OECD would produce nearly 1 percent yearly gains on average over the medium term.

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Andrews and Cingano (2014)	OECD PMR and EPL	1.34 million firm-level observations in 21 OECD countries in 2005; approximately 40 nonfarm industries included per country	Firm, Industry/Sector and Country	Difference-in-differences, controlling for country and industry fixed effects; robustness checks utilize instrumental variables	Product and labor market regulations adversely affect allocative efficiency, as measured by within-industry covariance between a firm's size and its productivity level. Simulations at the country level suggest that lowering entry barriers in each country to the lowest level in the EU would double allocative efficiency in the entire area and boost labor productivity in the EU by 15 percent.
Cette, Lopez, and Mairesse (2016)	OECD PMR (NMR) and EPL	18 industries in 14 countries, unbalanced panel running from 1987 to 2007	Country and Industry/Sector	Calibrated structural model (similar to Blanchard and Giavazzi (2003)); dynamic OLS, with country, industry, year or country-industry, industry-year and country-year fixed effects (depending on regression); simulations are run to assess the impact of reforming anticompetitive regulations at the country level	Adopting the lightest practices with respect to PMR, EPL, and harmonized tariffs results in average long-term national gains of about 4.4 percent, ranging from 1.1 percent to 7.0 percent, depending on the country. About 30 percent of gains are expected to be achieved in six years.
Égert (2016)*	OECD PMR (ETCR) and EPL	34 OECD countries over a roughly 30-year period	Country	OLS, with country and year fixed effects in some specifications	Anticompetitive PMR and more restrictive EPL are associated with lower TFP levels. Results are not always statistically significant, depending on controls (e.g., year fixed effects). Implementing product and labor market reforms jointly may bring more benefits than one-sided reforms. A more business-friendly environment amplifies the benefits of R&D spending on TFP.

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Cette, Lopez, and Mairesse (2017)	OECD PMR (NMR)	13 industries in 15 OECD countries, 1987–2007	Country and Industry/Sector	Calibrated structural model including a productivity equation and two factor demand equations for R&D and ICT; dynamic OLS controlling for country, industry, year, country-year, country-industry, and industry-year fixed effects (depending on regression); simulations aggregate industry estimates to the country level.	Upstream nonmanufacturing regulations lower productivity by reducing incentives for business investments in R&D and ICT in downstream industries. Simulations suggest that implementing the lightest upstream regulatory practices could increase national TFP between 1 and 12 percent over 12 years, depending on the country.
Égert and Gal (2017)	OECD PMR and EPL	34 OECD countries (number varies depending on model specification); 1985–2015, but years vary depending on specification.	Country	Calibrated neoclassical growth model, with country and year fixed effects	Of various reforms studied, product market reforms are estimated to have the largest single policy effect on GDP per capita: a 0.7 percent increase 5 years after reform. Labor market regulation's impact is 0.2 percent.
D'Costa, Garcilazo, and Martins (2019)	OECD PMR and EPL	265 regions within 24 OECD countries, 1997–2007	Subnational region	Calibrated neoclassical growth model, with regional fixed effects	Nation-level regulatory reforms enhance productivity growth at the subnational region level. Product market reforms that eliminate barriers to entrepreneurship have a larger effect on growth of regions closer to the frontier. Employment protection reforms increase in their benefits with distance from the frontier.

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Note: Sample sizes sometimes varied within studies owing to data availability across model specifications.

EPL = employment protection legislation; ETCR = electricity, transport, and communications Regulation; EU = European Union; FDI = foreign direct investment; ICT = information and communications technology; IMD = International Institute for Management Development; NMR = nonmanufacturing regulation indicators; OECD = Organisation for Economic Co-operation and Development; OLS = ordinary least squares; PMR = product market regulation; TFP = total factor productivity.