



# **The impact of regulation on growth**

A REPORT PREPARED FOR THE DEPARTMENT OF BUSINESS,  
INNOVATION AND SKILLS

May 2012



# The impact of regulation on growth

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## Executive Summary

### *Background and objective*

The Better Regulation Executive (BRE) of the Department of Business, Innovation and Skills (BIS) is responsible for the cross-Whitehall framework that aims to control regulatory burdens on business. This aim is driven by the belief that, if business resources are freed up, these can be used for productive means, which should facilitate growth. This is of particular importance in the current economic climate as one of the UK government's priorities is to stimulate economic growth.

However, the relationship between regulation and growth is complex. Regulations can have a positive impact on growth by removing certain market failures and improving economic efficiency. Regulations can have a negative impact on growth by creating substantial compliance costs, undesirable market distortions or unintended consequences. The overall impact of regulation on growth depends on which effect is larger and this can vary depending on particular circumstances.

As the relationship between regulation and growth is complex, BRE has asked Frontier Economics to review the relevant literature on the theoretical and empirical links between regulation and economic growth. The literature review is intended to provide a sound evidence base and inform policy decisions.

### *Scope and approach*

The focus of the literature review is on product market and labour market regulation. The BRE limited the scope of the research by excluding financial regulation and indicating that environmental regulation is less of a priority as the Department for Environment, Food and Rural Affairs (Defra) has commissioned a research project that deals specifically with environmental regulation and growth. The scope of the literature review included the impact of alternatives to regulation on growth and the potential impact of regulation on growth via the creation of new markets. Our approach involved developing a long list of 94 articles that we filtered to a short list of 36 articles using a range of selection criteria. For more detail on our approach, refer to Annexe 1.

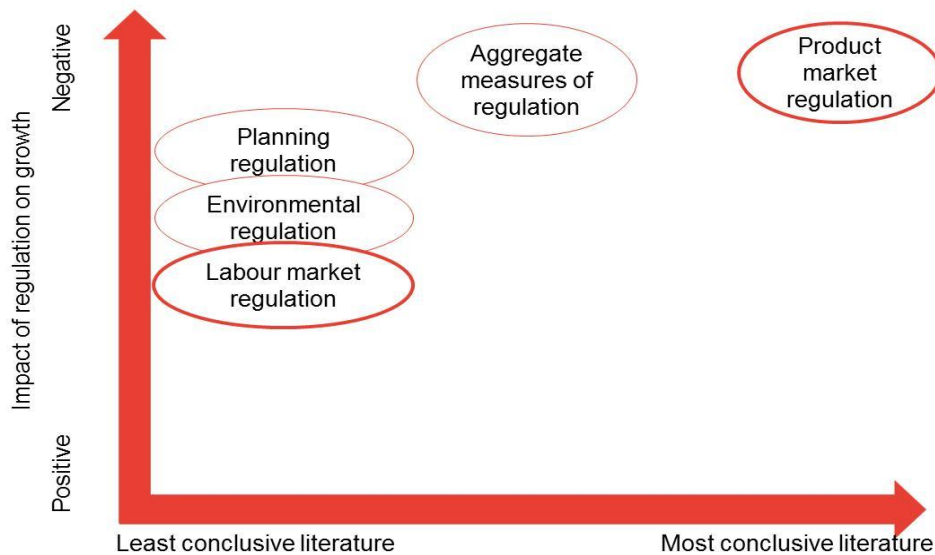
Most of the literature does not deal with the impact of regulation on growth directly but instead focuses on the impact of regulation on one of the growth drivers (labour productivity, investment, innovation, total factor productivity). This also implies that the literature focuses on the permanent growth implications of regulations that are driven by factors such as a change in incentives or market structure. One-off reductions in growth as often measured by compliance costs are not considered separately.

None of the measures of regulation capture the regulatory design or quality of regulations. Most of analysis in the literature relies on measures of regulation that translate legislative requirements into quantitative indicators. The concept of deregulation used in this report therefore refers to a reduction in such indicators.

### Main findings

The relationship between regulation and growth can be both positive and negative depending on the type of regulation considered. Our literature review has also indicated that the strength of the evidence varies with the type of regulation assessed. Figure 1 summarises our main findings. It shows the degree of conclusiveness derived from the literature review and the nature of the relationship between regulation and growth.

Figure 1. Summary of findings



Source: Frontier Economics

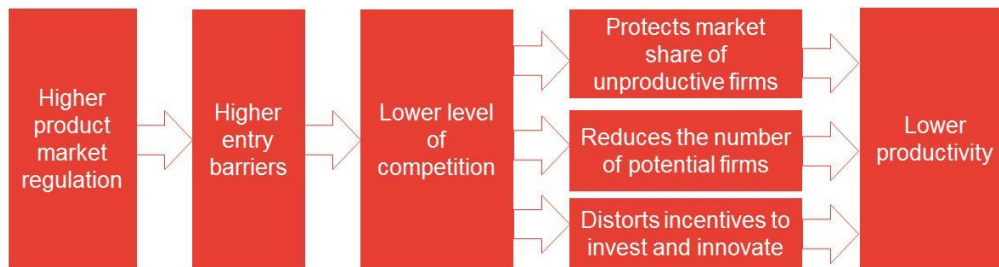
From the literature review, we can conclude that **product market regulation** is the area where the theoretical mechanisms and empirical evidence are most conclusive. While there is no widely accepted definition of product market regulation, in general product market regulation covers a broad range of rules that affect business operations during the firm life cycle including start up, operation and expansion and exit<sup>1</sup>. These product market regulations can have a

<sup>1</sup> See for example, Loayza et al. (2010) who define product market regulations those regulations that affect entry, trade, financial markets, bankruptcy and judicial administration.



negative and significant impact on economic growth. The key channel by which product market regulations affect growth is by creating barriers to entry and therefore reducing the level of competition in markets. Figure 2 summarises the theoretical mechanisms that link product market regulation and productivity.

Figure 2. Key theoretical mechanisms that link product market regulation and productivity



Source: Frontier Economics

Some of the most robust empirical evidence suggests that:

- Increasing the administrative costs of market entry can have a significant negative impact on productivity growth;
- A reduction in product market regulation has a positive impact on competition which increases innovation and therefore productivity;
- Regulation in upstream markets can have a significant negative impact on downstream market productivity; and
- Where regulatory burdens are lightest the reallocation of resources towards the highest productivity firms is stronger.

For example, Poschke (2010) finds that simulating the effect of changing the entry costs in the US from 1.7% of GDP per capita to 10% reduces total factor productivity by 0.8%. Even though the impact of product market regulation on growth may be relatively small when considered on a per annum basis, it can still have a significant long-term impact on standards of living.

**Aggregate measures of regulation** are generally based on indices that measure a range of regulations and other government interventions which are ultimately summarised in a single ranking or rating. Aggregate measures are different from the product market regulation indicators as they try to capture the business environment and cost of doing business. They are less focused on entry and exit and often also include some measure of labour market regulation.

Literature that uses aggregate measures of regulation indicates that cross-country differences in growth rates can partly be explained by differences in the level of

regulation. While the impact of regulation on growth in these studies is significant, the results are driven by large differences between the countries in the sample (e.g. developing vs. developed countries). For example, Djankov et al. (2006) finds that improving from the worst (first) to the best (fourth) quartile of business regulations (as measured by the World Bank Doing Business indicators) implies a 2.3 percentage point increase in average annual growth. Some of the research also finds a non-linear relationship between regulation and growth. This implies that the benefits to reducing the level of regulation are larger for highly regulated countries and diminishing with lower levels of regulation. As the UK is among the top ten deregulated countries (as measured by the World Bank Doing Business indicators and the Fraser Institute of Economic Freedom Index) the main findings of these studies do not apply to the UK.

The impact of UK **planning regulations** on growth has not been studied widely as the available literature focuses on the impact of planning regulations on specific sectors. The literature indicates that planning regulation can change the relative price of factor inputs (e.g. land, office space, etc.) and therefore have a negative impact on productivity in specific sectors. For example, Haskel and Sadun (2009) find that retail sector productivity growth would have been 0.44% per annum rather than the actual 0.07% per annum (between 1997/98 and 2002/03) in the absence of changes in store size brought about by changes in planning regulation. Using EUKLEMS data, we can infer that productivity growth in the UK would have been 0.16 percentage points higher per annum in the absence of changes in supermarket store sizes. On a growth accounting basis, TFP growth can be directly compared with average annual GDP growth of 3.6% between 1997/98 and 2002/03<sup>2</sup>. However, none of the studies on planning regulation use a holistic approach that includes all relevant sectors of the economy.

**Environmental regulation** may have a net positive impact on growth if positive effects on firm innovation offset the compliance costs. However, the empirical evidence appears to be mixed and the outcome depends on the regulatory design and type of regulation.

In addition to product market regulation, **labour market regulation** is the other important area that has an influence on growth. However, it is not clear whether labour market regulation has a net positive or negative impact on growth. Most of this literature focuses on the impact of employment protection legislation (EPL) on growth. The key theoretical channels are:

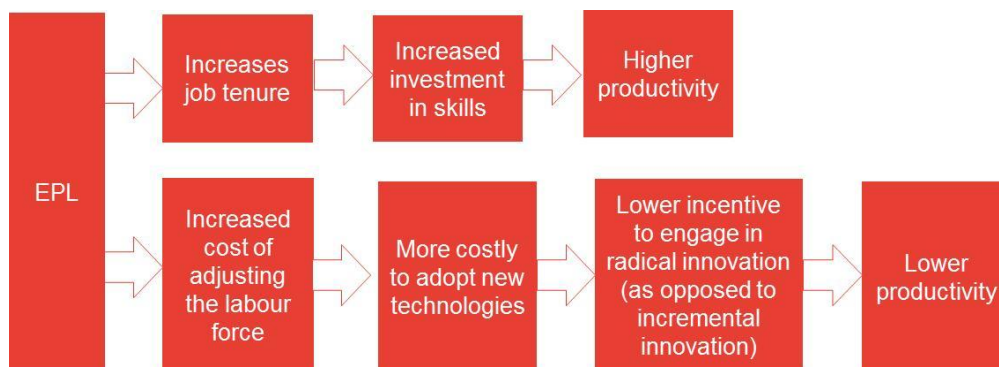
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<sup>2</sup> Gross Domestic Product: chained volume measures: Seasonally adjusted based on Office of National Statistics, Second estimate of GDP time series dataset 2011 Q4, Available <http://www.ons.gov.uk/ons/rel/naa2/second-estimate-of-gdp/q4-2011/tsd-second-estimate-of-gdp-2011-q4.html>

- *Positive link:* EPL increases employee's job tenure and therefore encourages investment in skills (both by the employer and employee), which has a positive impact on labour productivity and growth. EPL also increases the incentives to invest in incremental innovation that improves existing products.
- *Negative link:* EPL increases the cost of adjusting the labour force in the case of technological change. This makes it harder for firms to adopt new technologies or respond to changes in demand and can therefore reduce labour productivity and investment in new technologies that require adjustments to the labour force. EPL can also reduce the amount of radical innovation that firms engage in while increasing the amount of incremental innovation as radical innovation requires an adjustment of the workforce. This has a negative impact on growth as radical innovation is likely to have higher pay-offs.

Figure 3 summarises the key theoretical channels.

Figure 3. Key theoretical mechanisms that link labour market regulation and productivity



Source: Frontier Economics

The empirical evidence suggests that the theoretical links are valid (both those indicating a positive and a negative relationship) even though the impact of EPL may only have a strong effect in a small number of sectors where EPL is more binding due to low natural turnover.

The majority of the literature does not consider **small and medium enterprises** (SMEs) separately from other business. However, the following three findings apply to SMEs in particular:

- Regulation that increases the administrative costs of market entry can have a particularly strong impact on market entry of small firms as these firms are likely to be more credit constrained.

- The Porter Hypothesis states that environmental regulation can have a net positive impact on growth if the regulation leads to innovation that improves business performance and if the positive impact outweighs the direct business costs. Ambec et al (2010) argue that this may apply particularly to SMEs as they may be less likely to be profit-maximising due to, for example, a lack of time and technical expertise.
- Employment Protection legislation may have a stronger impact on SMEs as they are less able to substitute capital for labour due to credit constraints.

### *Implications for policy development*

In general, the UK is a highly deregulated economy when compared to other OECD countries. Against this background, the literature nevertheless indicates that further reduction of product market regulation is likely to have a positive impact on growth. It is more difficult to be certain about labour market regulations. From a policy perspective we would argue that employment protection legislation in particular, are carefully assessed in terms of costs and benefits before considering deregulation. In the context of new employment production regulation, it is important that regulatory impact assessments clearly set the balance between the potential negative and positive growth effects. The theoretical mechanisms described in this report could be used to undertake such an assessment.

Based on our main findings, Figure 4 provides an overview of the key implications for policy development in the UK in each of the areas of regulation.

Figure 4. Overview of key implications of findings

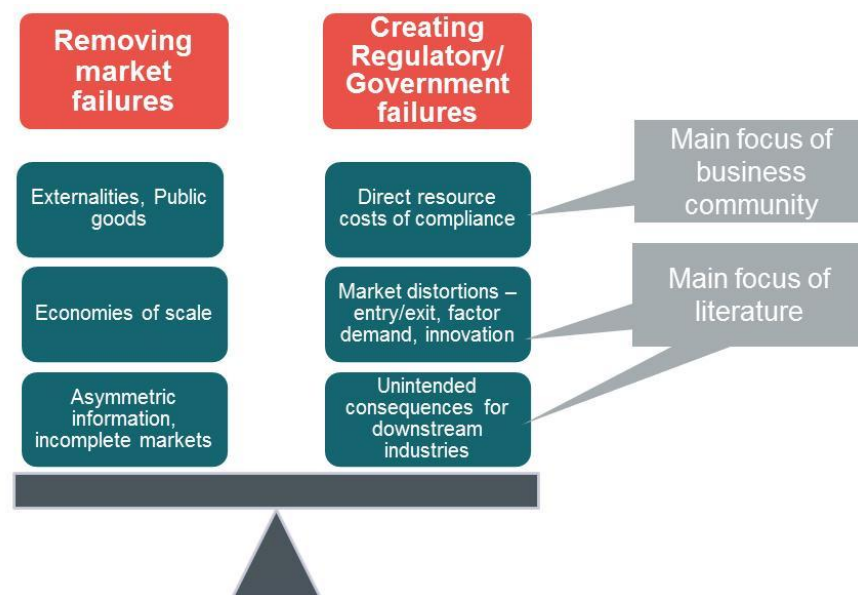
What are the implications for policy development in the UK?	
Product market regulation	<ul style="list-style-type: none"> <li>• Deregulation in this area is likely to have positive impacts on growth</li> <li>• An increase in product market regulation (for example as a result of having to implement EU regulation) is likely to have a negative impact on growth</li> </ul>
Labour market regulation	<ul style="list-style-type: none"> <li>• Employment protection legislation can have positive and negative impacts on growth</li> <li>• The theoretical mechanisms could be used as a basis for a growth assessment of new labour market regulations</li> </ul>
Planning regulation	<ul style="list-style-type: none"> <li>• As none of the studies use a holistic approach, this is an area for further research</li> </ul>
Aggregate measures of regulation	<ul style="list-style-type: none"> <li>• No clear implication as studies with aggregate measures of regulation cannot be used to determine the impact of a relatively small change in the level of regulation on growth for a highly deregulated country such as the UK</li> </ul>
Environmental regulation	<ul style="list-style-type: none"> <li>• The impact of environmental regulation on growth depends on the regulatory design and the specific context</li> </ul>

# 1 Introduction

A critical review of the literature needs to be based on a sound conceptual framework. We consider it important to clarify some of the key concepts before going into the detailed mechanisms of how regulations can affect growth.

Figure 5 illustrates that regulation can have a positive or negative impact on the economy. Regulations that are introduced to correct market failures such as economies of scale, asymmetric information, externalities or others have some positive impact on economic activity as they enhance economic efficiency. Reducing market failures can have a positive impact on economic growth even though this is not always the case as greater economic efficiency is not always captured by higher GDP growth (for example, in the case of pricing externalities). Such positive impacts on economic growth may be more than offset by high compliance costs, market distortions or unintended consequences. The overall impact of regulations that are intended to remove market failures depends on the balance between the two impacts as shown in Figure 5.

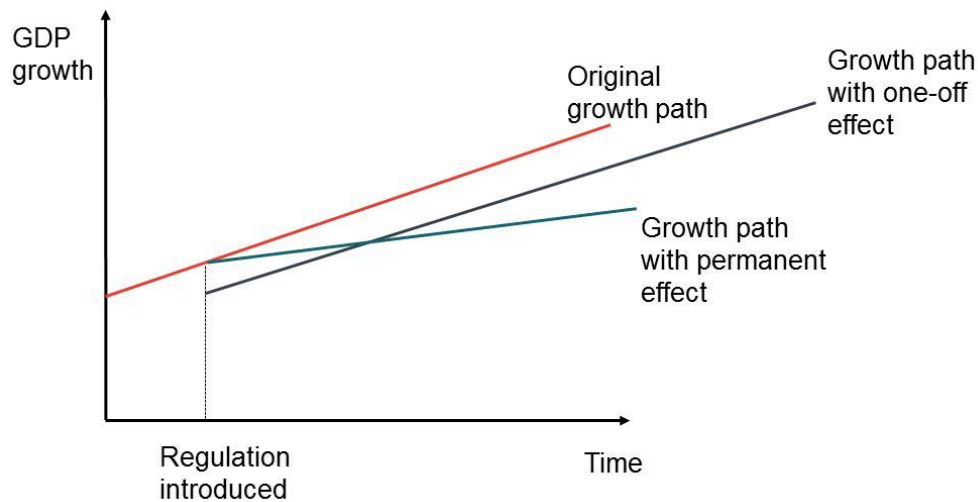
Figure 5. The impact of regulation on growth



Source: Frontier Economics

Regulation can affect the level of economic activity and the rate of economic growth. It is important to distinguish these two concepts illustrated in Figure 6. A change in the level of economic activity can still represent a significant reduction in economic activity but is a one-off impact. A change in the level of economic activity as a result of regulation is often measured by compliance costs even though compliance costs can also affect the permanent impact of regulations on growth. The business community generally focuses on compliance costs as they provide an indication of the amount of resources that are diverted from productive to non-productive uses as a result of regulation. However, such measures of direct compliance costs generally only include the one-off levels effect rather than the sustained impact of regulations on the rate of economic growth.

Figure 6. Illustration of one-off vs. permanent effect



Source: Frontier Economics

In contrast, the academic literature focuses more on the impact of regulation on the rate of growth. A substantial impact on the growth rate over time can lead to a substantial loss in output. As these impacts are larger than a change in the level of economic activity, it is good that this is the focus of the literature. The literature considers how regulations affect decisions to invest, innovate or to adopt new technology as these decisions have an impact on the growth rate rather than the level of economic activity.

Regulations that are not introduced on the basis of market failures are likely to have a negative impact on growth. Two main types can be identified:



- Regulation that is introduced to achieve wider government objectives such as equality or social cohesion is likely to have a negative impact on growth. However, this does not mean that these regulations should not be implemented. It implies that the positive impacts of these types of regulation are not captured in measures of economic growth. For example, if a regulation was to contribute to greater safety for individuals a significant part of this impact may not be measured in GDP.
- Regulation that is introduced on the basis of rent-seeking<sup>3</sup> will have a negative impact on growth.

## Economic growth drivers

To clarify some of the technical terms used in the study, we can consider a simple model of economic growth:

$$Y = A F(K,L)$$

where Y is output, A is total factor productivity, K is capital and L is labour. Using a Cobb Douglas production function, we can derive the growth rate of output per worker as follows:

$$Y = A K^\alpha L^{1-\alpha}$$

$$\frac{\partial Y}{Y} = \frac{\partial A}{A} + \alpha \frac{\partial K}{K} + (1 - \alpha) \frac{\partial L}{L}$$

$$\frac{\partial(Y/L)}{(Y/L)} = \frac{\partial A}{A} + \alpha \frac{\partial(K/L)}{(K/L)}$$

The last equation shows that growth in the output per worker is driven by total factor productivity growth (change in A) and growth in the capital-labour ratio (change in K/L). The capital-labour ratio grows when the required labour per unit of capital falls which may be due to investment in technology or skills.

### Key channels

Most of the literature does not deal with the impact of regulation on growth directly but instead focuses on the impact of regulation on one of the growth drivers (labour productivity, investment, innovation, total factor productivity). In these cases, the relationship between the growth drivers and economic growth is taken as given.

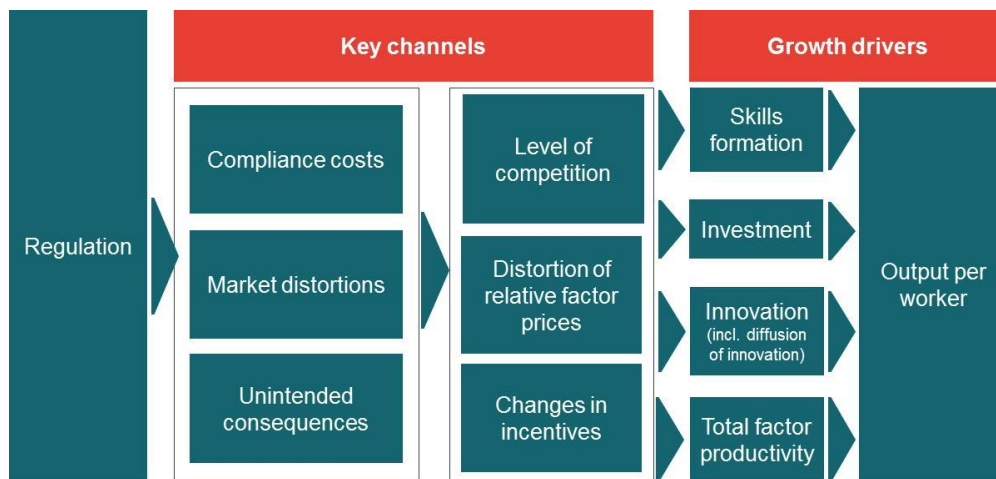
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<sup>3</sup> Rent-seeking includes activities such as lobbying by particular groups to gain a greater share of existing wealth.



The key channels by which regulation can have an impact on the growth rate are shown in Figure 7. Regulation can affect the level of competition, the relative prices of factor inputs and the incentives to invest (in both capital and labour) and innovate. As a result, skills formation, investment, innovation and total factor productivity may be affected which influence the output per worker and therefore have an impact on economic growth. The key channels presented here form underlying conceptual basis of most of the literature we reviewed.

Figure 7. Key channels



Source: Frontier Economics

### *Report outline*

This report is structured as follows:

- Section 2 provides the findings from the literature review on aggregate measures of regulation
- Section 3 provides our findings on product market regulation;
- Section 3 provides the findings on labour market regulation;
- Section 4 concludes.

Annexe 1 provides more detail on the methodology. Annexe 2 provides the list of literature that we reviewed. Annexe 3 provides a summary of the detailed empirical findings.

## 2 Aggregate measures of regulation

There are a number of aggregate measures of regulation such as the OECD indicators, World Bank Doing Business ranking and the Fraser Institute of Economic Freedom Index (each discussed in more detail below). These aggregate indices measure a range of regulations and other government interventions which are ultimately summarised in a single ranking or rating. Aggregate measures are different from the product market regulation indicators as they try to capture the business environment and cost of doing business.

### *Main findings*

Differences in the level of regulation can partly explain cross-country differences in economic growth. For the most regulated countries, a reduction in regulation is likely to have a positive impact on growth. However, growth impacts from deregulation are likely to diminish with the level of regulation in a particular country. As the UK is one of the most deregulated economies in the world, literature that uses aggregate measures of regulation cannot be used to inform the UK's regulatory policy.

### *Theoretical mechanisms and empirical evidence*

Our main findings are based on the review of a range of papers of which we present the three most relevant papers in this section. **Gorgens et al (2003)** acknowledge that regulation can have both a positive and negative impact on growth (see Figure 8). Regulation can increase growth when it improves economic efficiency by reducing market failures. However, regulation can decrease growth if it is based on other objectives such as rent-seeking. The purpose of the paper is to determine the functional form of the relationship between regulation and growth using a semi-parametric regression. A non-linear relationship could suggest that countries with a higher level of regulation are more likely to have a high proportion of those regulations that have a negative impact on growth.

Figure 8. Theoretical mechanisms based on Gorgens et al. (2003)

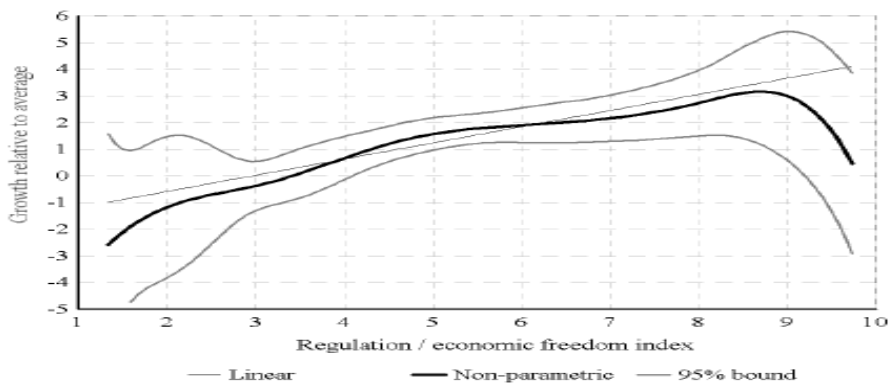


Source: Frontier Economics

The level of regulation is measured by the Fraser Institute of Economic Freedom Index with data available every five years from 1970-1995. The index combines ratings on a range of areas such as the size of the government, legal structure, access to sound money, freedom to trade and regulation of credit, labour and business into a single figure that ranks from zero to ten, with zero being the most highly regulated.

Gorgens et al (2003) find that the relationship between regulation and growth is non-linear. Heavily regulated countries on average grow 2-3% less than liberal ones. However, the bend of the curve is located at 5-6 on the scale of economic freedom where 10 represents the least regulated country and the UK scores 7.7 (in 2011). This implies that countries with relatively low levels of regulation (such as the UK) are unlikely to gain extra growth by further liberalisation.

Figure 9. The relationship between regulation and growth



Source: Gorgens et al (2003)

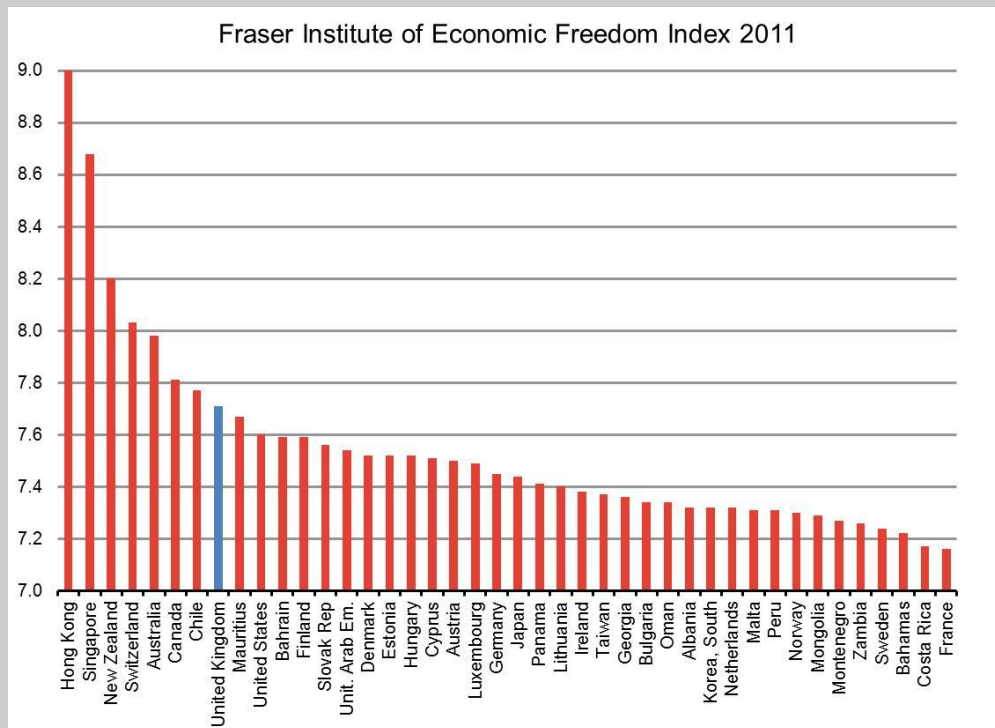
## The Fraser Institute Index of Economic Freedom

Forty-two data points are used to construct a summary index and to measure the degree of economic freedom in five broad areas:

1. Size of Government: Expenditures, Taxes, and Enterprises;
2. Legal Structure and Security of Property Rights;
3. Access to Sound Money;
4. Freedom to Trade Internationally;
5. Regulation of Credit, Labour, and Business.

The data is mainly sourced from the World Bank, International Monetary Fund and Global Competitiveness Report. **Figure 10** shows the top rankings of the latest survey. The top three countries are Hong Kong, Singapore, New Zealand. The UK ranks 8<sup>th</sup>, Germany ranks 21<sup>th</sup> and France 42<sup>nd</sup>.

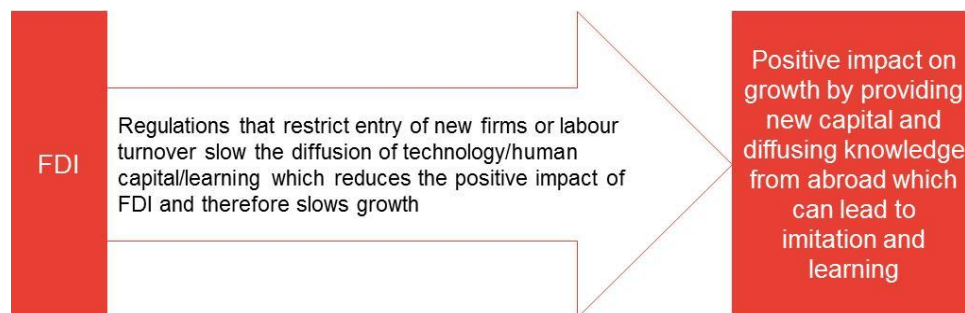
Figure 10. 2011 Fraser Institute of Economic Freedom – Top 42 countries



## Aggregate measures of regulation

**Busse and Groizard (2008)** focus on how regulations can change the impact that foreign direct investments (FDI) have on economic growth. FDI generally has a positive impact on growth as the capital stock is increased and knowledge from abroad is diffused via imitation and learning. Regulations that restrict entry of new firms or labour turnover slow the diffusion of technology and the increase in human capital which reduces the positive impact of FDI and therefore slows down growth. This mechanism is summarised in Figure 11.

Figure 11. Theoretical mechanisms based on Busse and Groizard (2008)



Source: Frontier Economics

Busse and Groizard (2008) use a standard cross-country growth regression with regulation interacted with FDI inflows and other control variables. Regulation is measured by five components of the World Bank Doing Business Indicators. The indicators cover 11 different areas including starting a business, registering property, enforcing contracts and protecting investors. Busse and Groizard (2008) select the five most relevant areas for their empirical analysis. They find that FDI does not stimulate growth in economies with excessive business and labour regulations. This finding applies to the 20-30% most regulated countries. The indicator on starting a business affects the impact of FDI on growth in particular. Overall, Busse and Groizard (2008) find that there is a threshold effect rather than a linear relationship between regulation and the impact of FDI on growth. Regulation has a negative impact on the way FDI can influence growth only in the most regulated countries.

## World Bank Doing Business Indicators

The World Bank Doing Business indicators measures the ease of doing business in the areas shown in Table 1 below.

Table 1. Area of business regulation measured by Doing Business indicators

Start up	Expansion	Operations	Insolvency
Starting a business	Registering property	Dealing with construction permits	Resolving insolvency
	Getting credit	Getting electricity	
	Protecting investors	Paying taxes	
	Enforcing contracts	Trading across borders	

Source: World Bank 2012

The data is collected by using a questionnaire that is used to survey experts in a range of fields including lawyers, accountants, freight forwarders, etc. The World Bank states that having a representative sample of respondents is not an issue as Doing Business is not a statistical survey as the texts of the relevant laws and regulations are collected and answers checked for accuracy. In 2012, the top three countries are Singapore, Hong Kong and New Zealand. The UK ranks 7<sup>th</sup>, Germany ranks 19<sup>th</sup> and France ranks 29<sup>th</sup>.

**Djankov et al. (2006)** examine the impact of regulation on growth on the basis that institutions are a major determinant of wealth and long-term growth. Countries that had better political and economic institutions in the past are richer today. Their analysis is based on the World Bank Doing Business Indicators. They find that the relationship between more business-friendly regulations and higher growth rates is consistently significant in various specifications of standard growth models. Improving from the worst (first) to the best (fourth) quartile of business regulations implies a 2.3 percentage point increase in average annual growth.

## Aggregate measures of regulation

### *Limitations of the results*

The literature that uses aggregate measures of regulation is subject to a number of limitations:

- The literature in this area uses aggregate indicators that measure a vast range of regulations and compares a large number of countries. The results are therefore driven by large cross-country differences.
- The indices do not capture the level of enforcement of regulations. The indices measure regulation imperfectly so differences may also be caused by legal frameworks or other factors.
- Results do not provide insights into how regulation affects growth within developed economies (e.g. within OECD).
- The literature cannot resolve the issue of reverse causality. While it may be true that lower regulations lead to higher growth, it is also possible that reducing regulation is easier at higher levels of income.
- Aggregate measures of regulation cannot provide any indication on the specific individual mechanisms or types of regulations that affect growth.

### *Potential implications for policy development*

The literature that uses aggregate measures of regulation cannot be used to determine the impact of regulation on growth in the UK as most of the findings apply to deregulation in highly regulated economies. The UK ranks 8th out of 183 countries on the 2012 Doing Business indicators and 7th out of 142 countries on the latest Fraser Institute of Economic Freedom Index. The findings from the literature cannot be used to infer the impact of regulatory reform that would change the UK's rating within the top quartile.

## 3 Product market regulation

Product market regulation covers a broad range of rules that affect business operations during the firm life cycle including start up, operation and expansion and exit. This section deals with three types of regulations that all fall within the wider definition of product market regulation: general product market regulation, planning regulation and environmental regulation.

### 3.1 Product Market Regulation

#### *Main findings*

There is strong evidence from industry- and firm-level studies that higher product market regulation reduces economic growth, even though the magnitude of the effect will depend on industry characteristics. Product market regulation discourages firm entry and dampens the intensity of competition between existing firms. It may also distort the prices of factor inputs and intermediate goods. Moreover, the impact of product market regulation on firms' incentive to innovate depends on the intensity of competition between firms and this can be either positive or negative. While the UK is a highly deregulated economy when compared to other countries in the OECD, further reduction of product market regulation is likely to have positive impacts on growth.

#### *Theoretical mechanisms and empirical evidence*

A large proportion of the papers we reviewed deal with the impact of product market regulation on growth. While our main findings are informed by all the papers we have reviewed, in this section, we only present those papers in detail that are most relevant, contain the most robust empirical results and represent the most common approaches.

**Figure 12** summarises the main mechanisms by which product market regulation can affect different types of efficiency. Product market regulation can protect the share of unproductive firms in the market, reduce the number of potential firms in the market and distort the incentives to invest, innovate and adopt new technology.



Figure 12. Overview of how product market regulation can affect efficiency

$A = \sum_{i=1}^N s_i a_i$ where $s_i$ and $a_i$ are the market share and productivity of firm $i$	
Allocative efficiency	<ul style="list-style-type: none"> <li>● PMR distorts <math>s_i</math> by protecting market share of unproductive firms</li> </ul>
Productive efficiency	<ul style="list-style-type: none"> <li>● PMR reduces the number of potential firms, which lessens the intensity of competition and lowers firm productivity, i.e. <math>a_i = f(N)</math></li> </ul>
Dynamic efficiency	<ul style="list-style-type: none"> <li>● PMR distorts firms' incentives to invest, innovate and adopt new technology, i.e. <math>a_i = f(N, \text{technology gap}, \text{investment}, \dots)</math></li> </ul>

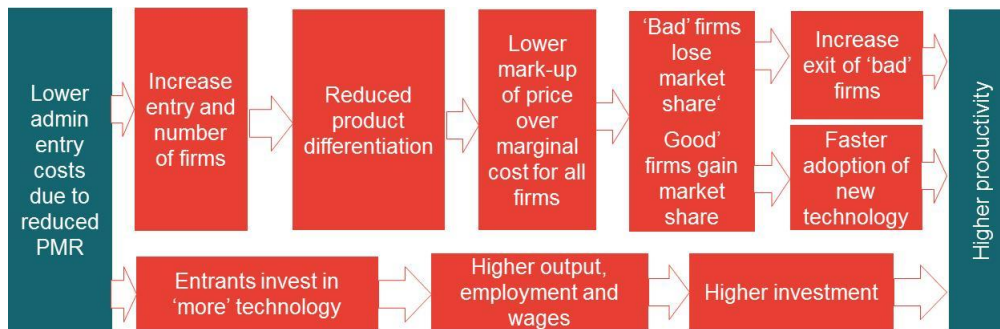
Source: Frontier Economics, note that PMR stands for Product Market Regulation

**Poschke (2010)** examines whether differences in entry costs can explain cross-country differences in total factor and labour productivity by influencing the technology choice of firms. Entry costs are defined as the “minimum costs needed to meet official requirements to legally operate a small industrial or commercial firm”. Higher administrative entry costs are expected to decrease entry and therefore reduce the level of competition in the market. As a result, firms have lower incentives to adopt new technology which reduces total factor productivity. Figure 13 summarises the positive effect of lower administrative entry costs on productivity. Poschke (2010) uses a dynamic stochastic game where the stationary equilibrium is calibrated to simulate different levels of entry costs<sup>4</sup>.

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<sup>4</sup> The analysis in this paper is based on a stochastic dynamic game theory setting, where players (firms) play infinitely many stages and the state of nature transits from one stage to another following a stochastic probability process. A stationary equilibrium in such a game is found where all players play their best response to other players and the resulting state transition converges to a steady state (stationary distribution). The game can be simulated by computer, and the parameters of the model can be calibrated to yield different desired equilibrium outcomes.

Figure 13. Theoretical mechanism based on Poschke (2010)



Source: Frontier Economics

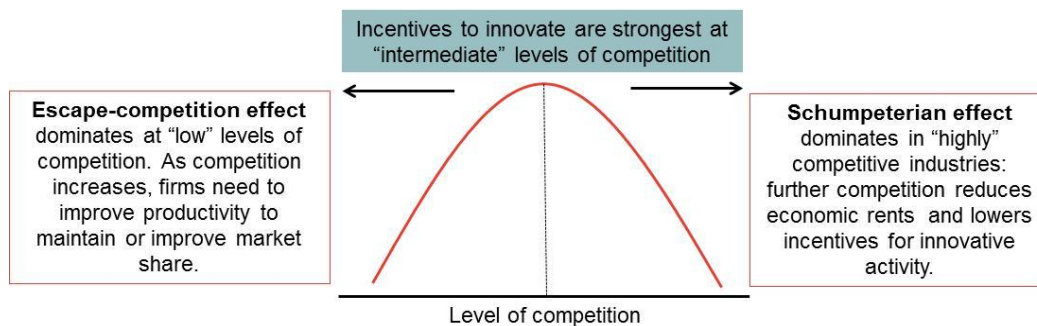
Data on administrative costs of entry are based on an earlier paper by Djankov (2002). Entry costs per firm are expressed as a proportion of GDP per capita. They range from levels as low as 1.7% for the US to 463% for the Dominican Republic with a cross-country average of 47%. Germany's entry costs are estimated as 32.5% of GDP per capita. Poschke (2010) simulates the effect of the entry costs in the US changing from 1.7% of GDP per capita to 30% (which is around the level of most of the European countries). This accounts for one-third of the observed TFP difference between Germany and the US. Given that administrative entry costs make up a small proportion of total start-up costs, the results are relatively high. Poschke (2010) finds that an increase in administrative entry costs from 1.7% to 10% of GDP per capita in the US reduces total factor productivity by 0.8%. The empirical results cannot be compared directly to the UK as Poschke simulates the effect of the administrative entry costs increasing in the US. However, Djankov (2002)<sup>5</sup> presents the administrative entry costs in the UK as 3.3% of GDP which is much closer to the US than most European countries. As a result, we can infer that total factor productivity in the UK is likely to fall if the administrative entry costs were increased to the level of Germany.

**Griffith, Harrison and Simpson (2010)** find that deregulation has had a negative impact on profitability (due to an increase in the level of competition) and a positive impact on innovation and total factor productivity. They use the introduction of the Single Market Programme (SMP) as an exogenous change in product market regulation and assess the impact of the SMP on firm profitability, R&D expenditure and TFP.

<sup>5</sup> See Djankov, S., La Porta, R., Lopez-de-Silanes, F. and Shleifer, A. (2002), The regulation of entry, Quarterly Journal of Economics, vol. 117(1), pp. 1–37.

Product market deregulation (such as the SMP) is expected to increase the intensity of competition, which influences firms' incentives to engage in innovative activity. The direction of the effect depends on the level of competition in the industry before and after deregulation. Deregulation may lead to either an increase or a decrease in innovative activity, following an "inverse-U" relationship (see Figure 14). Reducing competition in a perfectly competitive market is likely to increase innovation as firms will be able to retain a higher share of the returns to innovation due to higher mark-ups. In contrast, new regulation that reduces the level of competition closer to a monopoly is likely to have a negative impact on innovation. Aghion et al (2005) suggest that the inverted-U peaks at relatively low mark-ups<sup>6</sup>.

Figure 14. Illustration of inverse-U relationship between the level of competition and incentives to innovate

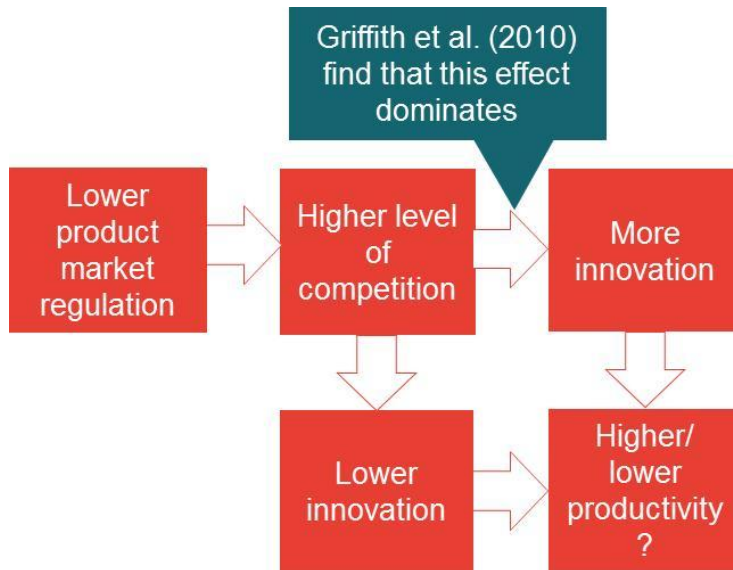


Source: Frontier Economics, note that the purpose of the figure is to illustrate the concept and the curve is unlikely to be symmetric.

Griffith et al. (2010) use the SMP to test whether innovation increased or decreased (see Figure 12).

<sup>6</sup> Aghion, P., Bloom, N., Blundell, R., Griffith, R. and Howitt, P. (2005), "Competition and Innovation: an Inverted U Relationship", *Quarterly Journal of Economics*, 120, 701-728. They suggest that the inverted-U peaks where  $(1 - \text{Lerner Index}) = 0.95$  with the Lerner Index defined as  $(\text{Operating Profit} - \text{Financial Cost}) / \text{Sales}$ .

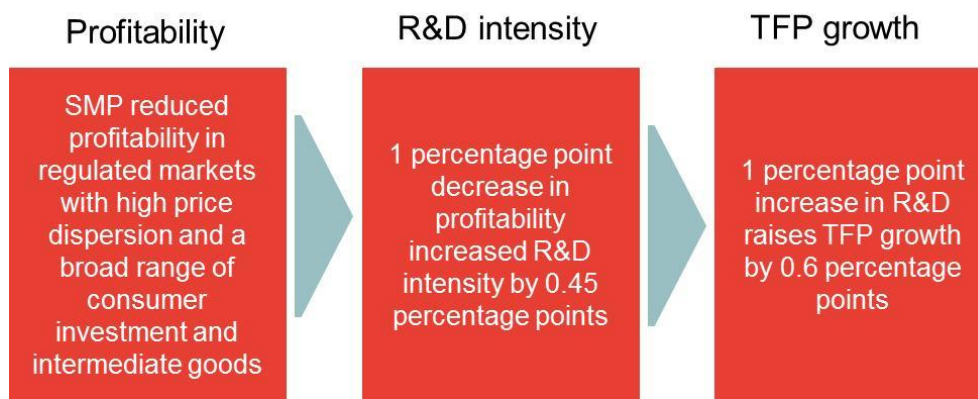
Figure 15. Theoretical mechanisms based on Griffith et al (2010)



Source: Frontier Economics

Griffith et al (2010) examine the impact of the SMP on those industries that are expected to be most affected. The empirical findings are summarised in Figure 16.

Figure 16. Empirical findings by Griffith et al (2010)



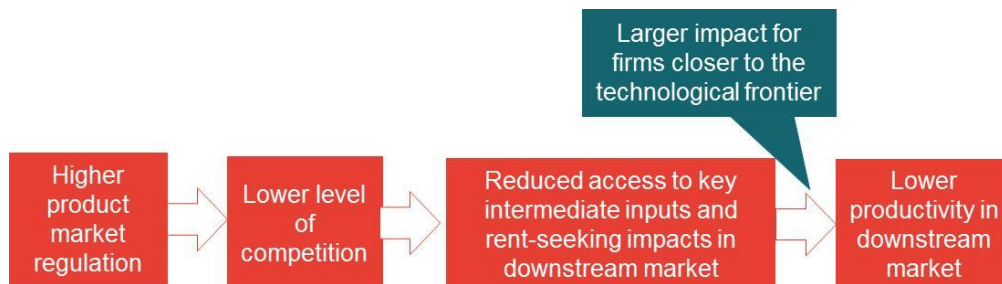
Source: Frontier Economics

**Bourles et al (2010)** focuses on the impact of regulation in upstream markets on downstream sector productivity through input-output inter linkages. If regulation reduces the level of competition in upstream markets, within-industry effects alone do not provide the full range of impacts as it is also important to address impacts on downstream sectors. Market power in upstream markets may

## Product market regulation

reduce incentives to improve efficiency and curb productivity in downstream sectors. For example, tight licensing requirements in retail trade or transport can narrow access to distribution channels. Figure 17 summarises this mechanism.

Figure 17. Theoretical mechanisms based on Bourles (2010)



Source: Frontier Economics

Bourles et al (2010) uses data from the OECD (see box below) over the past two decades to test the existence and magnitude of the potential negative impact of upstream market product regulations on downstream market productivity. They find that differences in regulation of non-manufacturing sectors that provide intermediate inputs can partly explain the variance of multifactor productivity (MFP) growth rates. The impact is higher for firms that are closer to the technological frontier. The impact also increases over time with the diffusion of ICT. Bourles et al (2010) find that over the 1995-2007 period (at the average MFP gap) eliminating all regulatory burdens in upstream sectors could have increased MFP growth by up to 1.7 percentage points per year.

## OECD Product Market Regulation Indicators

The OECD maintains a comprehensive set of indicators related to product market regulation. The OECD PMR indicators were designed to measure the extent to which policy settings promote or inhibit competition in areas of the product market where competition is viable. They include:

- Economy-wide indicators: state control of enterprises; legal and administrative barriers to entrepreneurship; barriers to trade and investment
- Sector-specific: Professional Services; Retail Trade; Energy, Transport & Communications
- Regulatory Impact: map sector linkages in input-output markets to capture 'knock-on' effects of regulation on 'downstream' firms

Most of the indicators were estimated in 1998, 2003 and 2008. Inputs are collected via questionnaires.

Our main findings are also supported by a range of papers that contain literature reviews of the impact of regulation on growth. One of the most recent and most relevant papers by **Arnold et al (2011a)** provides a review of a wide range of papers that cover the link between product market regulation and growth. They consider the same channels as suggested above: product market regulations reduce the level of competition in markets which has an impact on the incentives to innovate and/or adopt new technologies. Arnold et al (2011a) find that

- countries and industries where direct and indirect regulatory burdens are lighter have generally experienced the highest GDP per capita and productivity growth rates;
- evidence at the firm level suggests that where regulatory burdens are lighter the reallocation of resources towards the highest productivity firms is stronger.
- the implications of inappropriate regulations for productivity performance are estimated to be quantitatively important. Therefore, reforming such regulations can provide a significant boost to potential growth in OECD economies.

### *Limitations of the results*

The key limitations of the results are:

- While the direction of impact and key mechanisms are strongly supported by evidence, the magnitude of the impact is context-specific.
- It is possible that other factors that influence growth may interact with product market regulation. In this case measures of product market regulation may partly represent other factors that are not explicitly included in the theoretical mechanisms.
- Coverage of the product market regulation indicators is not complete as some types of regulation are not included. For example, the indicators generally do not represent measures of planning regulations (which is dealt with separately in section 3.2)
- The indicators represent product market regulation as stipulated by law and therefore do not take into account enforcement and implementation.

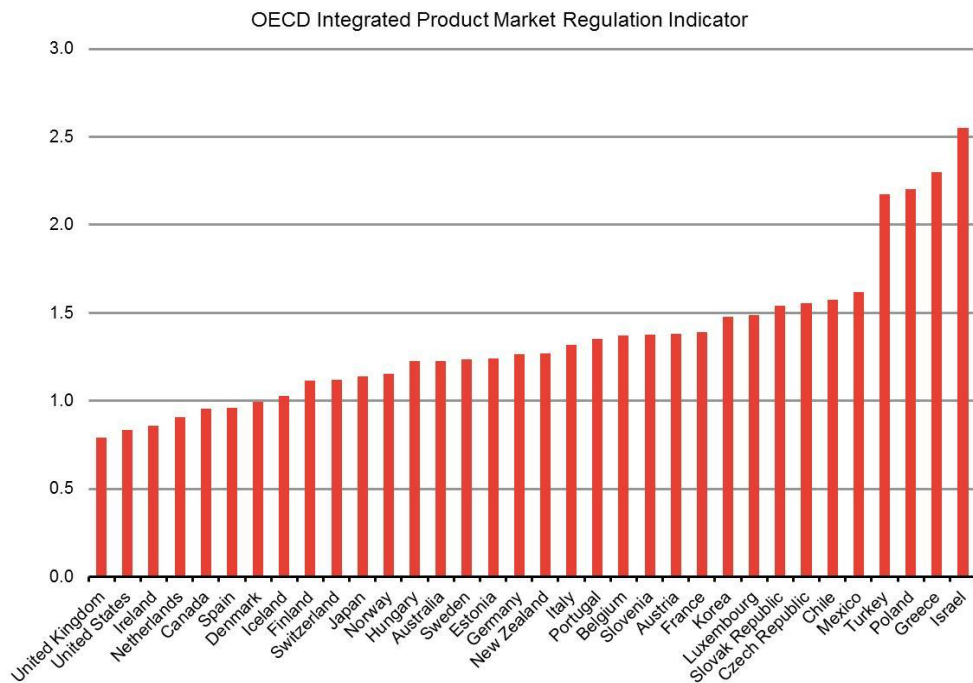
## Product market regulation

*Potential implications for policy development*

The theoretical mechanisms and empirical evidence provide strong evidence that product market regulation has a negative impact on growth. Figure 18 shows that the UK is the most deregulated economy in the OECD based on the aggregate OECD indicators for product market regulation. This finding is supported by the OECD estimates of mark-ups shown in Figure 19 as it suggests that suggest price-cost margins are relatively low in the UK services sector.

Nevertheless, the literature suggests that the impact of further deregulation in this area is likely to be positive as the impacts on the level of competition in markets is likely to persist even at low levels of regulation.

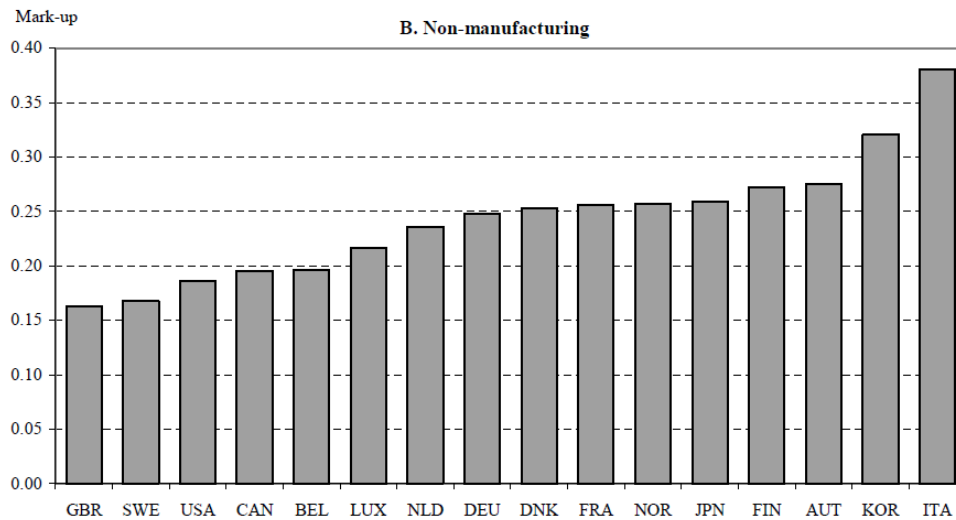
Figure 18. 2008 OECD Product Market Regulation Indicator



Source: OECD, Indicators of Product Market Regulation, Available [http://www.oecd.org/document/36/0,3746,en\\_2649\\_37443\\_35790244\\_1\\_1\\_1\\_37443.00.html](http://www.oecd.org/document/36/0,3746,en_2649_37443_35790244_1_1_1_37443.00.html)



Figure 19. Mark-up in non-manufacturing sector



Source: Hoj, J., Jimenez, M., Maher, M., Nicoletti, G., and Wise, M. (2007), "Product Market Competition in OECD Countries: Taking Stock and Moving Forward", OECD Economics Department Working Paper No. 575.

## 3.2 Planning regulation

### *Main findings*

There is some evidence to suggest that planning regulations have increased the cost of office space and reduced retail productivity. However, it is not clear what the overall net impact of planning regulation on growth is as most of the literature focuses on particular sectors rather than considering the economy as a whole. As a result, we consider this to be an area for further research.

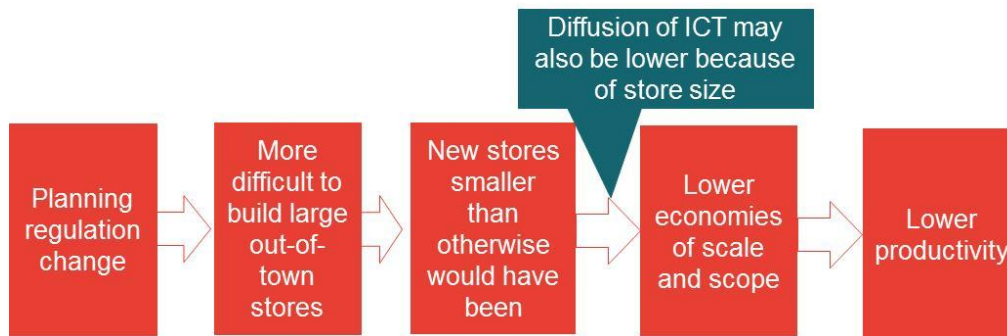
### *Theoretical mechanisms and empirical evidence*

Our main findings on planning regulations are based on the review by two papers. **Haskel and Sadun (2009)** examine the impact of planning regulations on productivity growth in the retail sector. In 1996 a change in planning regulation made it much harder for retailers to build large out-of-town stores as planning permission for such stores is only granted under special circumstances. As a result, new development shifted to smaller in-town stores. Economies of scale and scope in retail suggest that productivity is higher for larger stores. In addition, diffusion of ICT may also be lower with smaller store sizes as systems such as just-in-time delivery may be more difficult to implement. This mechanism is summarised in Figure 20.

### Product market regulation



Figure 20. Theoretical mechanism based on Haskel and Sadun (2009)



Source: Frontier Economics

Haskel and Sadun (2009) use UK micro data to examine the impact of within-firm changes in store size on firm productivity. Overall firm size, fixed effects and other production inputs are all controlled for. They find that firms with smaller within-firm store sizes (measured either as median size or proportion of small stores) are associated with lower productivity. More specifically the impact is estimated as follows:

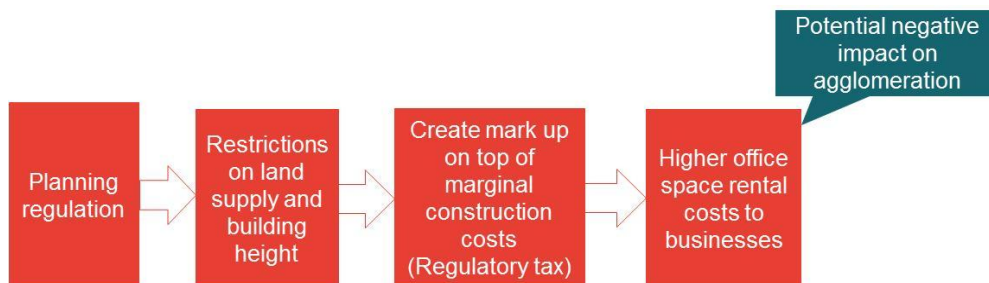
- A 1% reduction in the median store size reduces productivity by 0.0261%.
- A 1% increase in the proportion of small stores reduces productivity by 0.0712%.

Overall, Haskel and Sadun (2009) estimate that in the absence of changes in supermarket store sizes, retail sector TFP growth would have been 0.44% per annum rather than the actual 0.07% per annum (between 1997/98 and 2002/03). The EUKLEMS database implies that retail made up 4.4% of total economic output in 2007. This implies that economy-wide TFP growth would have been 0.16 percentage points higher in the absence of planning restrictions. On a growth accounting basis, TFP growth can be directly compared with average annual GDP growth of 3.6% between 1997/98 and 2002/03<sup>7</sup>.

<sup>7</sup> Gross Domestic Product: chained volume measures: Seasonally adjusted based on Office of National Statistics, Second estimate of GDP time series dataset 2011 Q4, Available <http://www.ons.gov.uk/ons/rel/naa2/second-estimate-of-gdp/q4-2011/tsd-second-estimate-of-gdp-2011-q4.html>

**Cheshire and Hilber (2008)** examine the impact of planning regulations on the cost of office space. They specifically estimate the “regulatory tax” on office space as a result of restrictions of land supply and building height restrictions. The regulatory tax is defined as the percentage difference between the market value of an additional square metre of office space and the marginal construction costs of adding one square metre of additional floor space. In the absence of any planning regulations and with perfect competition in the property development market, these values would be expected to be equal. Higher cost of office space increases the cost to business and may also have an impact on agglomeration. This mechanism is summarised in Figure 21.

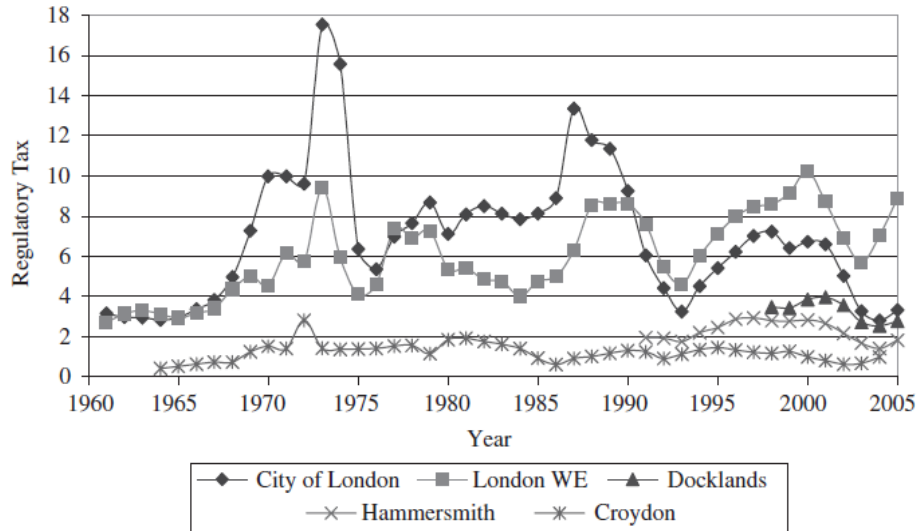
Figure 21. Theoretical mechanism based on Cheshire and Hilber (2008)



Source: Frontier Economics

Cheshire and Hilber (2008) estimate the regulatory tax for different areas of London, the UK and a number of international cities for different points in time. Figure 22 provides the estimates for different parts of London between 1960 and 2005.

Figure 22. Regulatory tax as estimated by Cheshire and Hilber (2008)



Source: Cheshire and Hilber (2008)

The regulatory tax rates in the City of London can be compared to other large European cities. In 2005, the regulatory tax in the City of London is estimated at 8.89% compared to Frankfurt (3.31%), Stockholm (3.30%) and Milan (4.11%).

### *Limitations of the results*

The key limitation of the literature that focuses on planning regulation is their narrow focus on the impact of regulation on one particular sector. For example, Haskel and Sadun (2009) focus on TFP growth in the retail sector without taking into account potential upstream and downstream impacts of the planning regulation. Their analysis takes the perspective of the store owners rather than the store users. For example, it is likely that in-town stores had some positive effect on store users' time savings. Similarly, Cheshire and Hilber (2008) do not consider wider impacts of planning regulation such as the potential impacts on the transport network. Neither of the two papers tries to estimate the benefits of planning regulations. If benefits of such regulations were estimated, it is not clear that there would be a net negative impact on growth.

Moreover, a key omission regarding the literature on planning regulations is the impact of planning regulations on restricting the size of agglomerations with negative implications for productivity<sup>8</sup>.

<sup>8</sup> See for example: Melo Patricia C. and Graham Daniel J. (2010), Agglomeration Economies and Labour Productivity: Evidence from Longitudinal Worker Data for GB's Travel-to- Work Areas.

In addition, Haskel and Sadun (2009) argue that the data demonstrates that larger stores benefit from economies of scale and scope. However, it is possible that the results represent a correlation of store size and location as larger stores are more likely to be located in rural areas and smaller stores are more likely to be located in urban areas. Larger stores that are located out of town are likely to have fewer competing stores in the surrounding area. As a result, they are likely to have higher sales density and higher productivity. The results in Haskel and Sadun (2009) may therefore capture a competition effect rather than economies of scale and scope.

### *Potential implications for policy development*

Overall, we conclude that there is some evidence to suggest that productivity growth in retail could have been higher in the absence of planning regulation that favours in-town retail shops. There is also some evidence to suggest that planning regulations increases the cost of office space. However, it is not clear whether planning regulations have an overall net negative impact on economic growth.

The literature in this area can therefore not be used to draw firm conclusions on the impact of planning regulation on growth. As a result, we recommend further research to be undertaken in this area that is based on a more holistic approach.

## **3.3 Environmental regulation**

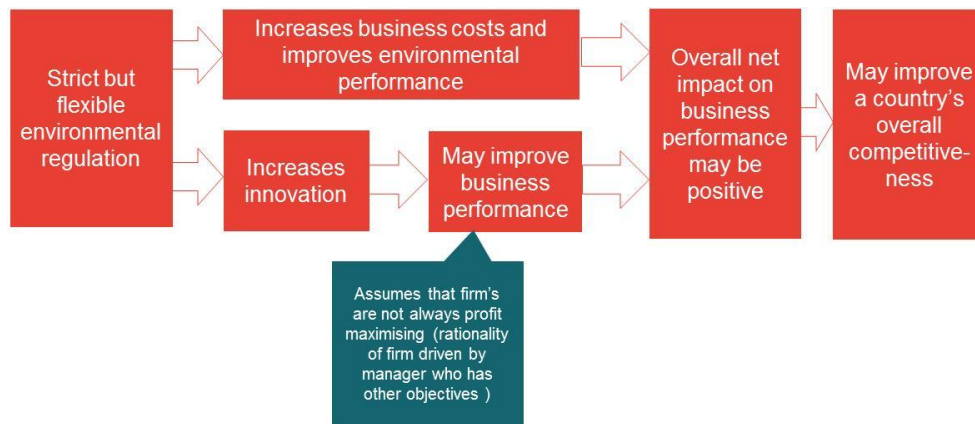
Even though environmental regulation was not the key focus of this report<sup>9</sup>, we have reviewed one paper that discusses the Porter hypothesis as it provides some interesting insights into how regulation may affect growth positively.

Ambec et al (2010) provide a discussion of the Porter hypothesis and the empirical evidence around different versions of the hypothesis. The Porter hypothesis states that environmental regulation can have a net positive impact on growth if the regulation leads to innovation that improves business performance and if the positive impact outweighs the direct business costs. The underlying assumption is that businesses are not always profit-maximising. The Porter hypothesis also suggests that environmental regulation is most likely to have a positive overall impact on growth if the regulatory design provides maximum certainty but is flexible in allowing firms to choose the technology or means of achieving regulatory goals. Figure 23 summarises the theoretical mechanisms.

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<sup>9</sup> The BRE limited the scope of the research based on the fact that Defra has commissioned a research project that deals specifically with environmental regulation and growth.

Figure 23. Theoretical mechanisms based on Ambec et al (2010)



Source: Frontier Economics

Ambec et al (2010) does not provide original empirical research but reviews empirical evidence on three hypotheses:

- Hypothesis 1: There is a link between environmental regulation and innovation;
- Hypothesis 2: Environmental regulation improves business performance; and
- Hypothesis 3: Environmental regulation can enhance a country's competitiveness.

On hypothesis 1, a range of studies find a positive link between environmental regulation and innovation but with varying degrees. Hypothesis two is not supported by a number of papers that find a negative impact of environmental regulation on productivity. However, more recent studies suggest that there are some positive indirect impacts of environmental regulations as innovation improves business performance. These positive impacts are not of sufficient size to offset the direct negative impact of regulation. There is no strong evidence that supports hypothesis 3 as the literature often considers the opposite impact. Countries with stricter environmental regulation will induce firms to move to countries with lower levels of environmental regulation.

## Regulation creating new markets

Our literature review has generally indicated that the creation of new markets is not a “standard” theoretical mechanism by which regulation may have an impact on growth. However, according to the Porter Hypothesis, environmental regulation may also lead to innovation that creates new markets, even though this again depends strongly on the specific context. Overall, the literature suggests that regulation has strong impact on the incentives to innovate but the specific nature of the innovation depends on the sectors considered.

## Alternatives to regulation

The impact of alternatives to regulation is not discussed in the literature that we reviewed. The Porter hypothesis captures the importance of regulatory design and suggests that regulation that allows firms to choose how to meet regulatory outcomes is more likely to have a positive impact on innovation. Ambec (2010) also discusses the potential for other government interventions such as training to lower compliance costs and enhance the business performance. However, in this context it is not viewed as an alternative but rather as a complement to regulation.

## 4 Labour market regulation

### *Main findings*

Most of the literature that investigates the link between labour market regulations and growth focuses on employment protection legislation. The theoretical mechanism between employment protection legislation and growth suggest that there is both a positive and a negative impact:

- EPL has a positive impact on investment in skills;
- EPL has a negative impact as it creates high adjustment costs which can constrain adaptation of new technologies such as information and communication technologies.

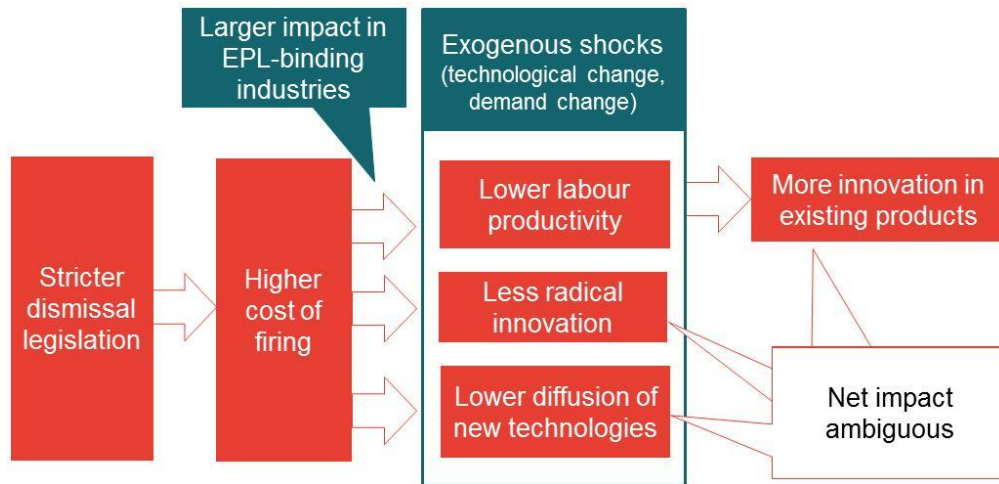
Overall, the empirical evidence provides mixed results and it is not clear which effect dominates. While this implies that there are no overall implications for policy development in the UK can be derived, it is nevertheless important to ensure that both theoretical mechanisms are considered when introducing new types of regulation.

### *Theoretical mechanisms and empirical evidence*

Our main findings are based on the review of four key papers. The first two papers discussed in this section deal with the impact of employment regulation on innovation. While they find that higher EPL can have both positive and negative impacts on innovation, it is likely that the impact on overall productivity growth is negative. The third paper discussed in this section finds a negative relationship between higher EPL and investment. In contrast, the last paper discussed in this section finds that the impact of lower EPL on skill investment and subsequent total factor productivity is negative.

**Bassanini et al (2009) and Griffith & Macartney (2010)** examine the impact of employment protection legislation on total factor productivity. Stricter dismissal legislation will increase the cost of firing. This increases adjustment costs so that firms are less likely to adjust to exogenous changes (such as technological change or a change in demand) by adjusting their labour force. As a result, labour productivity may be lower. Firms are also less likely to invest in new technologies when these require significant adjustments in the labour force. The same applies to radical innovation as this is more likely to involve higher adjustment costs. However, firms have an increased incentive to invest in incremental innovation that improves existing products as such innovation does not require a change in the labour force. Overall the theoretical link between stricter dismissal laws and total factor productivity demonstrate that there are positive and negative impacts and it is not clear which impact dominates. The theoretical mechanisms are summarised in Figure 24.

Figure 24. Theoretical mechanisms based on Bassanini et al (2009) and Griffith & Macartney (2010)



Source: Frontier Economics

Dismissal regulation can be measured using three OECD indicators on employment legislation that measure the regulations around regular employment, temporary contracts and additional legislation around collective dismissals.

**Bassanini et al (2009)** find that mandatory dismissal regulations (such as minimum notice periods, involvement of third parties including courts, labour inspectorates, works' councils, etc) had a depressing impact on TFP growth between 1982 and 2003 in industries where layoff restrictions are more likely to be binding. This impact is only measured for dismissal regulation of regular contracts as opposed to temporary contracts. EPL-binding industries are defined as industries with low natural turnover that have a relatively high natural propensity to adjust their human resources through layoffs due to industry-idiosyncratic technological and market-driven factors. They are identified by considering industries with a layoff rate that is higher than the average or median layoff rates. Such industries include: textiles, wearing app. and leather, rubber and plastics, basic metals and fabricated metal, electrical and optical equipment, manufacturing; recycling, post and telecommunications. Using the EUKLEMS database, these sectors made up 25.6% of the total gross output in 2007<sup>10</sup>.

Bassanini et al (2009) find that a one point reduction in the EPLR index (which is representative of the difference between the UK and the US) would raise the relative TFP growth rate of EPL-binding industries by 0.43-0.48 percentage points. Importantly, this would translate in an economy-wide TFP growth impact of about 0.11-0.12 percentage points. We can infer that a reduction of

<sup>10</sup> Based on EUKLEMS data from 2007, Available <http://www.euklems.net/>



EPL from UK to US levels would increase GDP growth by approximately 0.11 percentage points. The results can be compared against recent (real) GDP growth of 1.3% in 2010<sup>11</sup>.

**Griffith and Macartney (2010)** examine the impact of EPL on innovation. They use within-firm data for multinationals to assess whether firms choose to undertake incremental innovation versus radical innovation. Innovation activity is measured by the number of patents with radical innovation defined by the proportion of citations on a patent application made to scientific journals. EPL is measured using the OECD indicators. Radical innovation is likely to be more profitable but also requires higher adjustment costs whereas incremental innovation requires lower adjustment costs but is likely to have a smaller impact on overall profitability. Griffith and Macartney (2010) find that within multinational firms more innovation is undertaken by subsidiaries in countries with high EPL. They also find that the more technologically advanced innovation is performed by subsidiaries in countries with a low level of EPL.

The research suggests that if Italy and Germany moved from an above-average EPL level to the OECD average, this would result in a fall in overall patents by 20%. If Denmark moved from its below-average EPL level to the average EPL level, overall patenting would increase by 37% but radical innovation would reduce by 6%. The overall impact on EPL on growth can therefore be disaggregated into a positive and a negative effect. It follows that EPL have both a positive and negative effect on innovation and subsequently growth. The literature is unable to distinguish the relative impact of the different types of innovation on growth.

**Cingano (2010)** examines the impact of higher dismissal costs on the investment per worker. On the one hand, higher dismissal costs can distort production choices towards the more flexible input (i.e. capital) as they raise the costs of adjusting the labour force. This would suggest that capital per worker is higher with stricter dismissal laws. On the other hand, EPL may give workers more bargaining power which creates a “hold up” problem. The “hold up” problem occurs when a firms’ investment would increase productivity but also increases workers’ bargaining power. Workers bargaining power can reduce the returns to investments as strict EPL allows workers to bargain for a higher share of the investment return. This would suggest that capital per worker is lower with stricter dismissal laws. Cingano considers whether the impact of higher dismissal laws on investment per workers is different for credit-constrained companies. Cingano defines credit-constrained companies as companies with a small number of employees in this paper.

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<sup>11</sup> Based on Office of National Statistics, (2011), Quarterly National Accounts 4<sup>th</sup> quarter 2010

Figure 25. Theoretical mechanisms based on Cingano (2010)

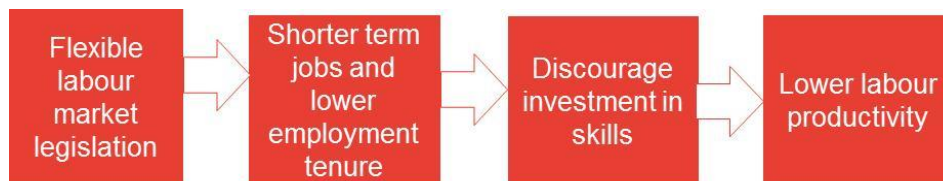


Source: Frontier Economics

Cingano (2010) finds that stricter EPL reduces investment and capital per worker, but increases the frequency of capital adjustments, consistent with the 'hold-up' theory that EPL boosts workers' bargaining power. This negative effect applies to firms with less than 46 employees the effects of EPL are stronger for 'credit-constrained' firms (i.e. small firms).

**Damiani and Pompei (2010)** examine the relationship between labour market legislation and labour productivity. Flexible labour market legislation may decrease employment tenures which can discourage investment in skills. Lower skill levels could then lead to lower labour productivity. This is summarised in Figure 26.

Figure 26. Theoretical mechanisms based on Damiani and Pompei (2010)



Source: Frontier Economics

The empirical evidence suggests that “*it seems likely that shorter term jobs and lower employment tenures discourage investments in skills, while labour regulation, which sustain long term relationships, may present some advantages and would seem to be preferable to short-term arrangements in collaborative relations and bargaining governability*” (Damiani and Pompei 2010). Growth in the proportion of fixed term contract by 1% appears to reduce multi-factor productivity<sup>12</sup> by up to 0.017 percentage points which directly corresponds to GDP on a growth accounting basis. While the results are based on a sample that includes 15 European countries, they can be compared to recent (real) GDP growth in the UK of 1.3% in 2010. There is no significant impact of the proportion of part-time contracts on multi-factor productivity.

### Limitations of the results

The literature on the impact of labour market regulations on growth has a number of limitations:

- As the theoretical mechanism linking EPL and productivity and growth suggest both positive and negative impacts, the empirical results have to be interpreted with caution (i.e. statistical correlation should not be interpreted as causality).
- The impact of EPL cannot be measured in isolation as EPL may interact with other types of regulation. For example, Damiani and Pompei (2010) highlight the following limitation: *The four better performers of the sample [in terms of multi-factor productivity] (Ireland, UK, Finland and Sweden) all belong to different varieties of capitalism and have neither the same market-reliant arrangements nor the same sectoral fields of specialisation. This highlights that complementarities in labour, financial and product market regulation should be taken into account.*
- Use of indices that translate legislation into quantitative measures can create problems as they are ordinal instead of cardinal and do not capture enforcement of regulations or unintended consequences.

### Potential implications for policy development

The literature focuses on employment protection legislation and finds that such regulations can have both a positive and a negative impact on growth. While each of the theoretical mechanisms provides a valid link between employment protection and growth it is therefore difficult to derive high level implications for UK policy development. In addition, it is important to consider the relative position of the UK with respect to employment protection in the OECD as shown in Figure 27.

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<sup>12</sup> Multi factor productivity and total factor productivity can be used interchangeably.

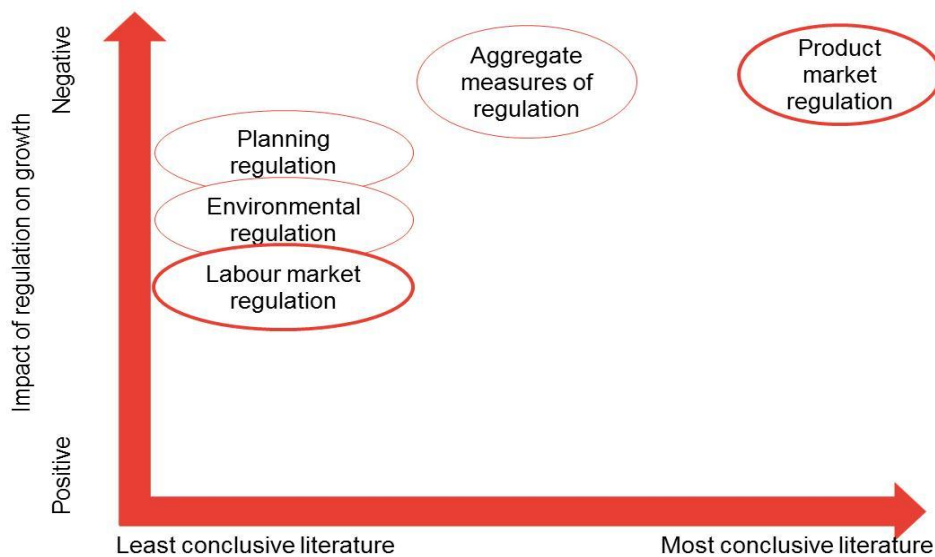


## 5 Conclusion

### Main findings

The relationship between regulation and growth can be both positive and negative depending on the type of regulation considered. Our literature review has also indicated that the strength of the evidence varies with the type of regulation assessed. Figure 28 summarises our main findings. It shows the degree of conclusiveness derived from the literature review and the nature of the relationship between regulation and growth.

Figure 28. Summary of findings



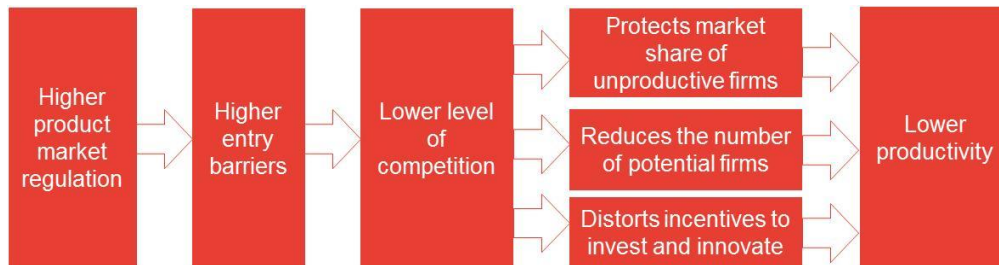
Source: Frontier Economics

From the literature review, we can conclude that **product market regulation** is the area where the theoretical mechanisms and empirical evidence are most conclusive. While there is no widely accepted definition of product market regulation, in general product market regulation covers a broad range of rules that affect business operations during the firm life cycle including start up, operation and expansion and exit<sup>13</sup>. These product market regulations can have a negative and significant impact on economic growth. The key channel by which product market regulations affect growth is by creating barriers to entry and

<sup>13</sup> See for example, Loayza et al. (2010) who define product market regulations those regulations that affect entry, trade, financial markets, bankruptcy and judicial administration.

therefore reducing the level of competition in markets. Figure 29 summarises the theoretical mechanisms that link product market regulation and productivity.

Figure 29. Key theoretical mechanisms that link product market regulation and productivity



Source: Frontier Economics

Some of the most robust empirical evidence suggests that:

- Increasing the administrative costs of market entry can have a significant negative impact on productivity growth;
- A reduction in product market regulation has a positive impact on competition which increases innovation and therefore productivity;
- Regulation in upstream markets can have a significant negative impact on downstream market productivity; and
- Where regulatory burdens are lightest the reallocation of resources towards the highest productivity firms is stronger.

For example, Poschke (2010) finds that simulating the effect of changing the entry costs in the US from 1.7% of GDP per capita to 10% reduces total factor productivity by 0.8%.

**Aggregate measures of regulation** are generally based on indices that measure a range of regulations and other government interventions which are ultimately summarised in a single ranking or rating. Aggregate measures are different from the product market regulation indicators as they try to capture the business environment and cost of doing business. They are less focused on entry and exit and often also include some measure of labour market regulation.

Literature that uses aggregate measures of regulation indicates that cross-country differences in growth rates can partly be explained by differences in the level of regulation. While the impact of regulation on growth in these studies is significant, the results are driven by large differences between the countries in the sample (e.g. developing vs. developed countries). For example, Djankov et al. (2006) finds that improving from the worst (first) to the best (fourth) quartile of

## Conclusion

business regulations (as measured by the World Bank Doing Business indicators) implies a 2.3 percentage point increase in average annual growth. Some of the research also finds a non-linear relationship between regulation and growth. This implies that the benefits to reducing the level of regulation are larger for highly regulated countries and diminishing with lower levels of regulation. As the UK is among the top ten deregulated countries (as measured by the World Bank Doing Business indicators and the Fraser Institute of Economic Freedom Index) the main findings of these studies do not apply to the UK.

The impact of UK **planning regulations** on growth has not been studied widely as the available literature focuses on the impact of planning regulations on specific sectors. The literature indicates that planning regulation can change the relative price of factor inputs (e.g. land, office space, etc.) and therefore have a negative impact on productivity in specific sectors. For example, Haskel and Sadun (2009) find that retail sector productivity growth would have been 0.44% per annum rather than the actual 0.07% per annum (between 1997/98 and 2002/03). Using EUKLEMS data, we can infer that productivity growth in the UK would have been 0.16 percentage points higher per annum in the absence of changes in supermarket store sizes. On a growth accounting basis, TFP growth can be directly compared with average annual GDP growth of 3.6% between 1997/98 and 2002/03<sup>14</sup>. However, none of the studies on planning regulation use a holistic approach that includes all relevant sectors of the economy.

**Environmental regulation** may have a net positive impact on growth if positive effects on firm innovation offset the compliance costs. However, the empirical evidence appears to be mixed and the outcome depends on the regulatory design and type of regulation.

In addition to product market regulation, **labour market regulation** is the other important area that has an influence on growth. However, it is not clear whether labour market regulation has a net positive or negative impact on growth. Most of this literature focuses on the impact of employment protection legislation (EPL) on growth. The key theoretical channels are:

- *Positive link:* EPL increases employee's job tenure and therefore encourages investment in skills (both by the employer and employee) and which has a positive impact on labour productivity and growth. EPL also increases the incentives to invest in incremental innovation that improves existing products.

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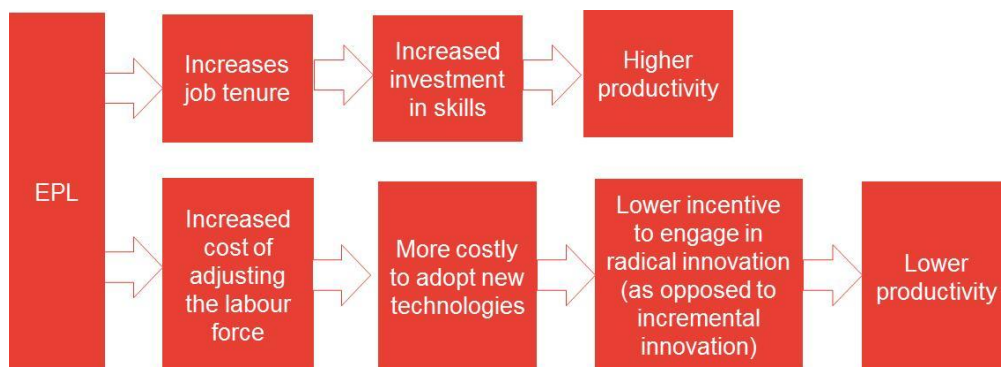
<sup>14</sup> Gross Domestic Product: chained volume measures: Seasonally adjusted based on Office of National Statistics, Second estimate of GDP time series dataset 2011 Q4, Available <http://www.ons.gov.uk/ons/rel/naa2/second-estimate-of-gdp/q4-2011/tsd-second-estimate-of-gdp-2011-q4.html>



- *Negative link:* EPL increases the cost of adjusting the labour force in the case of technological change. This makes it harder for firms to adopt new technologies or respond to changes in demand and can therefore reduce labour productivity and investment in new technologies that require adjustments to the labour force. EPL can also reduce the amount of radical innovation that firms engage in while increasing the amount of incremental innovation as radical innovation requires an adjustment of the workforce. This has a negative impact on growth as radical innovation is likely to have higher pay-offs.

Figure 30 summarises the key theoretical channels.

Figure 30. Key theoretical mechanisms that link labour market regulation and productivity



Source: Frontier Economics

The empirical evidence suggests that the theoretical links are valid (both those indicating a positive and a negative relationship) even though the impact of EPL may only have a strong effect in a small number of sectors where EPL is more binding due to low natural turnover.

The majority of the literature does not consider **small and medium enterprises** (SMEs) separately from other business. However, the following three findings apply to SMEs in particular:

- Regulation that increases the administrative costs of market entry can have a particularly strong impact on market entry of small firms as these firms are likely to be more credit constrained.

## Conclusion



- The Porter Hypothesis states that environmental regulation can have a net positive impact on growth if the regulation leads to innovation that improves business performance and if the positive impact outweighs the direct business costs. Ambec et al (2010) argue that this may apply particularly to SMEs as they may be less likely to be profit-maximising due to, for example, a lack of time and technical expertise.
- Employment Protection legislation may have a stronger impact on SMEs as they are less able to substitute capital for labour due to credit constraints.

*Implications for policy development*

In general, the UK is a highly deregulated economy when compared to other OECD countries. Against this background, the literature nevertheless indicates that further reduction of product market regulation is likely to have a positive impact on growth. It is more difficult to be certain about labour market regulations. From a policy perspective we would argue that employment protection legislation in particular, are carefully assessed in terms of costs and benefits before considering deregulation. In the context of new employment production regulation, it is important that regulatory impact assessments clearly set the balance between the potential negative and positive growth effects. The theoretical mechanisms described in this report could be used to undertake such an assessment.

Based on our main findings, Figure 31 provides an overview of the key implications for policy development in the UK in each of the areas of regulation.

Figure 31. Overview of key implications of findings

What are the implications for policy development in the UK?	
Product market regulation	<ul style="list-style-type: none"> <li>● Deregulation in this area is likely to have positive impacts on growth</li> <li>● An increase in product market regulation (for example as a result of having to implement EU regulation) is likely to have a negative impact on growth)</li> </ul>
Labour market regulation	<ul style="list-style-type: none"> <li>● Employment protection legislation can have positive and negative impacts on growth</li> <li>● The theoretical mechanisms could be used as a basis for a growth assessment of new labour market regulations</li> </ul>
Planning regulation	<ul style="list-style-type: none"> <li>● As none of the studies use a holistic approach, this is an area for further research</li> </ul>
Aggregate measures of regulation	<ul style="list-style-type: none"> <li>● No clear implication as studies with aggregate measures of regulation cannot be used to determine the impact of a relatively small change in the level of regulation on growth for a highly deregulated country such as the UK</li> </ul>
Environmental regulation	<ul style="list-style-type: none"> <li>● The impact of environmental regulation on growth depends on the regulatory design and the specific context</li> </ul>

## Annexe 1: Methodology

### Our approach

Our search focused on articles that deal with the relationship between regulation and growth. We searched for articles covering a range of theoretical approaches, including those that deal with the impact of regulation on other factors that can be related to growth via standard growth models (such as productivity, innovation, investment in physical and human capital).

We focused on articles that deal with the impact of regulation on growth in the developed world (e.g. OECD countries). While we included articles that use large multi-country datasets, we excluded articles that are solely focused on developing countries. We also excluded any articles that date pre-2000 and articles that focus on historic (e.g. pre-1970s) datasets. Our analysis mainly covers studies published in English, though we also searched for relevant articles published in German or French. Search terms included various combinations of the following:

- Regulation
  - Regulation, product market regulation, labour market regulation
  - Business regulation, environmental regulation, planning regulation
  - Compliance costs, trading standards
  - Alternatives to regulation, regulation and new markets
- Growth
  - Growth
  - Productivity
  - Innovation
  - Human capital
  - Investment, FDI

Our long list of literature was developed on the basis of the following steps:

- List of suggested articles from Professor Nicholas Crafts;
- Searches of academic databases including EconLit;
- Checking literature referred to in key articles (so-called snowballing);

- Targeted search of respected organisations including OECD, World Bank; and
- Review of a range of sources for articles including SSRN, IBSS, EU, IMF, UN, Government websites and relevant think tanks (CBI, TUC, Chambers of Commerce, IPPR, Reform, Policy Exchange).

### *Selection criteria for long list*

We have applied the following criteria to select articles for the long list:

- **Theoretical approach** – Our search focused on articles that deal with the relationship between regulation and growth and we are including articles with a range of theoretical approaches. We also include articles that deal with the impact of regulation on other factors (such as productivity, innovation, investment) that can be related to growth via standard growth models.
- **Type of regulation**
  - We include articles that deal with overall measures of regulation as well as articles that deal with specific areas of regulation (e.g. labour market, product market, health and safety).
  - We are not focusing on articles that deal with financial regulation, regulated network utilities and regulation around agriculture.
- **Relevance to the UK/EU** – we focus on articles that deal with the impact of regulation on growth in the developed world (e.g. OECD countries). While we include articles that use large multi-country datasets, we exclude articles that are solely focused on developing countries.
- **Quality** – articles need to be produced by respected individuals such as academics and experts in universities, research organisation and consultancies
- **Date** – we exclude any articles that date pre-2000 and articles that focus on historic (e.g. pre-1970s) datasets.
- **Language** – we exclude articles that are not published in English.

### Selection criteria for short list

We applied the following criteria to select articles for the short list:

- **Theoretical approach** – the short list represents all major theoretical approaches.
- **Type of regulation** - the short list covers different measures of regulation ranging from high level indices to specific measures.
- **Empirical studies** – the short list contains a large proportion of articles with empirical analysis.
- **Relevance to EU/UK** – articles are relevant to developed economies, in particular Europe and the UK. Our emphasis is on evidence from the UK or EU, though many research studies are based on US data.
- **Date** – we prioritise the most up to date list of relevant literature.
- **Review by Professor Nicholas Crafts** – the short list has been reviewed by Professor Nicholas Crafts to ensure that we capture the most important academic articles.
- **Microbusinesses and SMEs** – we have sought evidence on the impact of regulation on growth in the context of microbusinesses and SMEs.

### Overview of relevant literature

We compiled a comprehensive list of 94 articles with 36 “first-tier” articles selected for further detailed review (see Table 2). We selected articles produced by respected individuals such as academics and experts in universities, research organisation and consultancies.

In addition, we also identified potentially relevant research published by interested parties, including the British Chambers of Commerce (BCC), Confederation of British Industries (CBI) and Trades Union Congress (TUC). These articles provided useful context and helped identify issues relevant to businesses that have not come up in our search of the academic literature.

Table 2. Types of publications included in the literature review

	Examples	Long list	Short list
<b>Academic publications</b>	Economic Journal, European Economic Review	51	19
<b>Academic working papers</b>	CEPR, IZA Discussion Series	11	7
<b>International Institutes</b>	OECD, World Bank, EC, Bank of France	23	10
<b>Think-tanks</b>	IPPR, Policy Exchange, SBRC	4	0
<b>Trade organisations</b>	British Chambers of Commerce, TUC	5	0
<b>TOTAL</b>		<b>94</b>	<b>36</b>

Source: Frontier Economics



## Annexe 2: List of literature reviewed

- Alesina, A., Ardagna, S., Nicoletti, G. and Schiantarelli, F., (2005), Regulation and Investment Journal of the European Economic Association, Vol 3, pp 791-825
- Ambec, S., Cohen, M., Elgie, S. and Lamoie, P., (2010), The Porter Hypothesis at 20: Can Environmental Regulation Enhance Innovation and Competitiveness? CIRANO Serie Scientifique No 29
- Arnold, J., Nicoletti, G. and Scarpetta, S., (2011a), Regulation, Resource Reallocation and Productivity Growth, Nordic Economic Policy Review Vol 2, pp 61-97
- Arnold, J., Nicoletti, G. and Scarpetta, S., (2011b), Does Anti-Competitive Regulation Matter for Productivity? Evidence from European Firms, IZA Discussion Paper No 5511
- Barone, G. and Cingano, F., (2011) Service Regulation and Growth: Evidence from OECD Countries, Economic Journal Vol 121, Issue 555, pp 913-957
- Bassanini, A., Nunziata, L. and Venn, D., (2009) Job Protection Legislation and Productivity Growth in OECD Countries Economic Policy Vol 24, pp 349-402
- Brandt, N., (2004), Business Dynamics, Regulation and Performance OECD working paper No 2004/3
- Bourlès, R., Cette, G., Lopez, J., Mairesse, J., Nicoletti, G., (2009), Do product market regulations in upstream sectors curb productivity growth? Panel data evidence for OECD countries, Banque de France working paper No 283
- Busse, M. and Groizard, J.L. (2008) Foreign Direct Investment, Regulations and Growth, World Economy, Vol 31 Iss 7 pp 861-886
- Cheshire, P. and Hilber, C., (2008), Office Space Supply Restrictions in Britain: the Political Economy of Market Revenge Economic Journal Vol 118, pp F185-F221
- Chittenden, F., Kauser, S., Poutziouris, P., Sloan, B., (2005), Regulations and Small Business in the EU, USA and UK: A Review, Wirtschaftspolitische Blätter Vol 52, Iss 2, pp 230-244
- Cincera, M., Galgau, O., (2005), Impact of Market Entry and Exit on EU Productivity and Growth Performance, European Commission, Directorate-General for Economic and Financial Affairs, Economic Paper No 222 ISSN 1725-3187
- Cingano, F., Leonardi, M., Messina, J. and Pica, G., (2010), The Effects of Employment Protection Legislation and Financial Market Imperfections on Investment: Evidence from a Firm-Level Panel of EU Countries, Economic Policy Vol 25, pp 117-163

- Conway, P., de Rosa, D., Nicoletti, G. and Steiner, F., (2006), Regulation, Competition and Productivity Convergence, OECD Economics Department Working Paper No 509
- Conway, P. and Nicoletti, G., (2006), Product market regulation in the non-manufacturing sectors of the OECD countries: measurement and highlights, OECD Working Paper No. 530
- Crafts, N., (2006), Regulation and Productivity Performance, Oxford Review of Economic Policy Vol 22, No 2
- Golec, J., Hegde, S. and Vernon, J., (2010), Pharmaceutical R & D Spending and the Threat of Price Regulation, Journal of Financial and Quantitative Analysis Vol 45, pp 239-264
- Damiani, M., Pompei, F., (2010), Labour protection and productivity in EU economies: 1995-2005, European Journal of Comparative Economics, Vol. 7, n. 2, pp. 373-411
- Dar, A., Amir Khalkhali, S., (2011), On the Impact of Regulation on Economic Growth in OECD Countries, 2011 Barcelona European Academic Conference
- Djankov, S., McLeish, C., Ramalho, R., (2006), Regulation and Growth, World Bank Working Paper
- Fang, L. and Rogerson, R., (2011), Product Market Regulation and Market Work, American Economic Journal: Macroeconomics, v. 3, iss. 2, pp. 163-88
- Gorgens, T., Paldam, M., Wurtz, A., (2003), How does Public Regulation affect Growth? University of Aarhus Department of Economics Working Paper, Working Paper No 2003-14
- Gorgens, T., Paldan, M. Wurtz, A., (2005), Growth, Income and Regulation: a Non-Linear Approach
- Griffith, R. and Harrison, R. 2004 The Link between Product Market Regulation and Macroeconomic Performance European Commission Economic Papers No 209
- Griffith, R. and Macartney, G., (2010) Employment Protection Legislation, Multinational Firms and Innovation, CEPR Discussion Paper No 7628
- Griffith, R., Harrison, R. and Simpson, H., (2010), Product Market Reform and Innovation in the EU, Scandinavian Journal of Economics Vol 112, pp 389-415
- Hansford, A., Hasseldine, J., Howorth, C., (2003), Factors Affecting the Costs of UK VAT Compliance for Small and Medium-Sized Enterprises, Environment and Planning C: Government and Policy, Vol 21 iss 4 pp 479-492
- Haskel, J. and Sadun, R., (2009), Regulation and UK Retailing Productivity: Evidence from Micro-Data, CEPR Discussion Paper No 7140

## Annexe 2: List of literature reviewed



- Jacobzone, S., Steiner, F., Lopez Ponton, E., Job, E., (2010), Assessing the Impact of Regulatory Management Systems, OECD Working Paper on Public Governance No 17
- Klapper, L., Laeven, L. and Rajan, R., (2006), Entry Regulation as a Barrier to Entrepreneurship Journal of Financial Economics Vol 82, pp 591-629
- Loayza, N. V., Oviedo, A. M., and Servén, L., (2010), Regulation and Macroeconomic Performance, Business Regulation and Economic Performance, pp 65-117
- Nicodeme, G., Sauner-Leroy, J., (2004), Product market reforms and productivity: a review of the theoretical and empirical literature on transmission channels, European Commission, Directorate-General for Economic and Financial Affairs, European Economy, Economic Papers No. 218
- Nicoletti, G. and Scarpetta, S., (2003), Regulation, Productivity and Growth Economic Policy Vol 18, pp 9-72
- Poschke, M., (2010), The Regulation of Entry and Aggregate Productivity Economic Journal Vol 120, pp 1175-1200
- Scarpetta, S., Tressel, T., (2002), Productivity and Convergence in a Panel of OECD Industries: Do Regulations and Institutions Matter? OECD Economic Working Paper No. 342
- Schiantarelli, F., (2010), Product Market Regulation and Macroeconomic Performance Business Regulation and Economic Performance, pp 23-63



## Annexe 3: Detailed overview of selected empirical evidence

This Annexe provides more detail on the empirical approach used in the main articles referred to in Sections 2, 3 and 4.

<b>Article</b>	<p>Arnold, J., Nicoletti, G., Scarpetta, S., (2011), "Regulation, Resource Reallocation and Productivity Growth", Nordic Economic Policy Review, Volume 2, pp 61-97</p>
<b>Data</b>	<p>Dependent variable: The Olley-Pakes indicator reflects the relative contribution of allocative efficiency to the observed overall average productivity level.</p> <p>Firm-level data from Amadeus database. TFP is measured as a residual, the part of output not explained by factor inputs. The authors then decompose TFP into unweighted average of firm-level TFP (productive efficiency) and a term capturing the degree to which more productive firms have higher market shares (allocative efficiency), following Olley and Pakes (1996).</p> <p>Key explanatory variable: Regulation Impact indicator from OECD International Regulation Database, to capture intersectoral impacts on downstream industries.</p> <p>Sample period: 1998-2004</p> <p>Coverage: Austria, Belgium, Finland, France, Germany, Italy, Portugal, Spain, Sweden, United Kingdom</p>
<b>Experimental set-up</b>	<p>Fixed-effect specification with time-varying country-specific and sector-specific effects</p> <p>Regress allocative efficiency indicator on sector-specific indicators of regulatory impact (and country- and sector- fixed effects)</p>
<b>Hypothesis</b>	<p>Anticompetitive regulations reduce the efficiency of the reallocation process within industries</p>
<b>Robustness</b>	<p>Coefficients for regulation impact indicators are all significant at 5% or 1%:</p> <ul style="list-style-type: none"> <li>▫ -0.33 for overall business sector (significant at 1%)</li> <li>▫ -0.37 for services sector (significant at 5%)</li> <li>▫ -0.30 for ICT using sectors (significant at 5%)</li> </ul>

**Key findings**

Regulatory burdens have a negative effect on the efficiency of resource allocation in the overall business sector. This relationship is driven by the services sector, and is stronger for sectors that rely on ICT.

**Limitations**

The study provides evidence of a negative correlation between anticompetitive regulation and allocative efficiency within industries, but may reflect reverse causality.

<b>Article</b>	<p>Bassanini, A., Nunziata, L. and Venn, D., (2009) Job Protection Legislation and Productivity Growth in OECD Countries Economic Policy Vol 24, pp 349-402</p> <p>Quantified degree of stringency of EPL(as defined by legislative requirements) by using three OECD indicators: 1. Index for regular employment 2. Index for temporary contracts 3. Index on additional legislation. Indices range from 0 to 6, i.e. from least to most restrictive.</p>
<b>Data</b>	<p>EUKLEMS database with TFP growth for 16 OECD countries over 25 years (both a public and non-public version) as well as data on value added, industry specific purchasing power parities, capital service growth, employment, hours worked and labour composition by skills, age and gender.</p> <p>US layoff rates from 2004 CPS Displaced Workers Supplement to identify baseline measures of industry layoff propensity: 1. quantitative indicator equal to average industry layoff rate, 2. qualitative indicator EPL-binding defined as those with a layoff rate above the average for all industries over the three years. UK data used as a sensitivity test (Quarterly labour force survey 1997-2003)</p>
<b>Experimental set-up</b>	<p>Industry level cross-country time-series evidence on the impact of EPL on productivity, using difference-in-difference method</p>
<b>Hypothesis</b>	<p>Estimate the impact of the degree of stringency of individual dismissal regulations (EPLR) on cross-industry differences in 'fully adjusted' TFP as theory suggests that the net effect could be positive or negative.</p>
<b>Robustness</b>	<p>Large number of robustness checks taking into account a range of potential issues</p>
<b>Key findings</b>	<p>A one point reduction in the EPLR index (which is representative of the difference between the UK and the US) would raise the relative TFP growth rate of EPL-binding industries by 0.43-0.48 percentage points.</p>
<b>Limitations</b>	<p>Dataset based on translating legislation into quantified variables</p>

<b>Article</b>	<p>Bourles, R., Cette, G., Lopez, J., Mairesse, J., Nicoletti, G., (2010), "Do product market regulations in upstream sectors curb productivity growth? Panel data evidence for OECD countries", Banque de France Working Paper No 283</p>
<b>Data</b>	<p>Sample period: 1985-2007          Coverage: 15 OECD countries, 20 industries          Extent of upstream regulation: OECD Product Market Regulation indicators, with input-output tables used to calculate the importance of upstream industry <math>j</math> to downstream industry <math>k</math>          Authors report results for the full sample period, as well as two sub-samples: 1985-1994 and 1995-2007. We report results for 1995-2007.</p>
<b>Experimental set-up</b>	<p>Error-correction model specification:  <math display="block">\Delta \ln MFP_{cs,t} = \alpha_1 \Delta \ln MFP_{Fs,t} + (1-\alpha_0) gap_{cs,t-1} + \alpha_3 REG_{cs,t-1} + \alpha_4 [REG_{cs,t-1} \cdot gap_{cs,t-1}] + \text{sector fixed effects} + \text{country-year fixed effects} + \text{random error term}</math>         where <math>gap_{cs,t-1}</math> is the country-industry pair distance from the industry frontier          and <math>REG_{ckt} = \sum_j NMR_{cjt} \cdot w_{cjk}</math> with <math>0 &lt; w_{cjk} &lt; 1</math></p> <p><math>NMR_{cjt}</math>: anti-competitive regulation in country <math>c</math> for non-manufacturing sector <math>j</math> at time <math>t</math>, and weight <math>w_{cjk}</math> is the total input requirement of sector <math>k</math> for intermediate inputs from non-manufacturing sector <math>j</math></p>
<b>Hypothesis</b>	<p>Lack of upstream competition curbs downstream efficiency improvements:  <math>\alpha_3 + \alpha_4 \cdot gap &lt; 0</math>          If <math>\alpha_3 &lt; 0</math> and <math>\alpha_4 &lt; 0</math>, then the negative effects of regulation on productivity growth are stronger further away from the technology frontier;          if <math>\alpha_3 &lt; 0</math> and <math>\alpha_4 &gt; 0</math>, then the negative effects of regulation on productivity growth are stronger near the technology frontier (and there may be cases where upstream regulation has a net positive effect on downstream productivity growth).</p>
<b>Robustness</b>	<p>Endogeneity: Changes in OECD measures of anti-competitive regulation in non-manufacturing sectors can be considered reasonably exogenous to productivity changes in individual downstream manufacturing industries.</p> <p>Omitted variables: Country-time fixed effects account for domestic characteristics of labour or financial markets; sector fixed effects account for structural differences between industries.</p> <p>Measurement error: Estimation results robust to alternate measures of key variables</p>

### Annexe 3: Detailed overview of selected empirical evidence

**Key findings**

$\alpha_3 = -0.124$  (significant at 1%)

$\alpha_4 = 0.132$  (significant at 5%)

$\alpha_4$  is positive and significant for all estimation samples, suggesting that lack of competition in upstream sectors is particularly damaging for industries near the global technology frontier.  $\alpha_3$  is negative and significant for 1995-2007; it is not significantly different from zero at 10% significance level for the full sample or the earlier sub-sample 1985-1994.

Eliminating all regulatory burdens in upstream sectors from 1995-2007 could have increased multi-factor productivity growth by up to 1.7 percentage points per year.

**Limitations**

The analysis is reported in a working paper from the Banque de France from June 2010, with a slightly more recent version published as an NBER working paper in November 2010. The estimates may change as the authors refine their analysis.

<b>Article</b>	Busse, M. and Groizard, J.L. (2008) Foreign Direct Investment, Regulations and Growth, <i>World Economy</i> , Vol 31 Iss 7 pp 861-886
<b>Data</b>	<p>Real growth of GDP per capita in per cent World Bank</p> <p>GDP per capita in international US\$ (PPP) World Bank</p> <p>Foreign direct investment, net inflows in per cent of GDP UNCTAD</p> <p>Composite regulation index for business regulations, labour market regulations, contract regulations, creditor rights and insolvency regulations, January 2003 World Bank</p> <p>Composite regulation dummy for the 20/30/40/50 per cent most regulated countries in the sample, 0 and 1, January 2003 World Bank</p> <p>Rule of law, 0–6 scale PRS Group (2007)</p> <p>Change in consumer prices (CPI), computed as <math>\ln(1+\text{CPI average inflation})</math> World Bank</p> <p>Population growth in per cent World Bank</p> <p>Government consumption divided by GDP World Bank</p> <p>Black market premium (BMP) for foreign currency (US\$) in per cent, calculated as <math>\ln(1+\text{BMP})</math> World Bank</p> <p>Total imports and exports divided by GDP World Bank</p> <p>Distance from the equator, measured as absolute value of latitude of capital city World Bank</p> <p>Fraction of population speaking a European language World Bank</p> <p>Legal origin dummies for British and French law, 0 and 1 World Bank</p> <p>Average years of secondary schooling, ages 25+ Barro and Lee (2001)</p> <p>Financial variables Beck et al (2000)</p> <p>Generalised method of moments technique</p>
<b>Experimental set-up</b>	<p>Regression of growth in the most recent 10-year period (1994–2003) on growth in the previous 10-year period (1984–93) and on changes from the previous to the current period in FDI and the other explanatory variables and an interactive term of regulation and FDI,</p> <p>Independent variables: FDI inflows (measured as annual average of net FDI inflows as a share of GDP), average investment share of GDP, average rate of population growth, schooling years at secondary level at the beginning of the current period and an indicator for the rule of law, dummy for top 20 per cent most regulated economies human capital levels, measured as average years of secondary schooling, imports and exports divided by GDP, total government consumption as a share of GDP, • changes in consumer prices in per cent, black market premium for foreign currency (US\$), in per cent and a range of other variables</p>
<b>Hypothesis</b>	Regulation has a negative effect on the positive impact of FDI on growth

### Annexe 3: Detailed overview of selected empirical evidence



<b>Robustness</b>	Key results are statistically significant at 10% or better
<b>Key findings</b>	They find that FDI does not stimulate growth in economies with excessive business and labour regulations. This finding applies to the 20-30% most regulated countries. The indicator on starting a business affects the impact of FDI on growth in particular. Overall, Busse and Groizard (2008) find that there is a threshold effect rather than a linear relationship between regulation and the impact of FDI on growth.
<b>Limitations</b>	Use of composite indicators that quantify a wide range of regulations and legislation

<b>Article</b>	Cingano, F., Leonardi, M., Messina, J. and Pica, G., (2010), The Effects of Employment Protection Legislation and Financial Market Imperfections on Investment: Evidence from a Firm-Level Panel of EU Countries, <i>Economic Policy</i> Vol 25, pp 117-163
<b>Data</b>	2006 DVD format of Amadeus database which is a firm-level dataset collected by the Bureau van Dijk containing balance-sheet data for a sample of European firms. Analysis is restricted to the period 1997–2003 (but robustness checks for additional years undertaken. The 14 countries included are: Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Italy, the Netherlands, Poland, Portugal, Spain, Sweden and the United Kingdom.
<b>Experimental set-up</b>	$Y_{ijt}^c = (E_t^c \times BenchFlow_j) \delta + E_t^c \phi + X_{ijt}^c \gamma + \mu_t + \mu_j + \mu^c + D + \varepsilon_{ijt}^c$ <p>Firm level outcome (of firm I in country c, industry j at time t) is dependent on:  Employment protection legislation (E) and the extent of “intrinsic” job reallocation in the sector (BenchFlow), Employment protection legislation (E), a range of firm, industry or time specific variables (<math>\mu</math>) and firm level control variables (X), and a vector of dummy variables including country by year interactions (D).</p>
<b>Hypothesis</b>	$Y_{ijt}^c = (E_t^c \times BenchFlow_j) \delta_0 + (E_t^c \times IR_{ijt}^c) \delta_1 + (IR_{ijt}^c \times BenchFlow_j) \delta_2 + (E_t^c \times IR_{ijt}^c \times BenchFlow_j) \delta_3 + E_t^c \phi_0 + IR_{ijt}^c \phi_1 + \beta ROA_{ijt-1} + \mu_i + D + \varepsilon_{ijt}^c$ <p>This equation also includes a measure of internal resources in country c (IR) and a third level interaction term that captures the effect of EPL on investment.</p>
<b>Robustness</b>	<p>The coefficient of the interaction term (E x BenchFlow) is negative and significant.</p> <p>All results are significant at the 1% significance level with the exception of considering the probability of investment as the dependent variable (Y).</p> <p>Range of robustness checks included.</p>
<b>Key findings</b>	EPL reduces capital per worker, investment per worker and labour productivity in high reallocation sectors relative to low reallocation sectors. The magnitude of the effect is economically not negligible and lies around 11.2%, 11.4% and 7% of the difference in, respectively, the capital-labour ratio, the intensive margin of investment per worker and labour productivity of high relative to low reallocation industries.
<b>Limitations</b>	Accuracy and coverage of firm-level dataset provide limitations on the analysis.

### Annexe 3: Detailed overview of selected empirical evidence

<b>Article</b>	Cheshire, P. and Hilber, C., (2008), Office Space Supply Restrictions in Britain: the Political Economy of Market Revenue Economic Journal Vol 118, pp F185-F221
<b>Data</b>	<ul style="list-style-type: none"> <li>▫ Davis Langdon: marginal cost of construction from estimated time-series of construction data (from Spon Handbook)</li> <li>▫ Gardiner and Theobald: (average) construction cost data for sample of continental European cities</li> <li>▫ CB Richard Ellis (CBRE): data on rents, yields, vacancies for British markets and total occupation cost data</li> <li>▫ Jones Lang LaSalle (JLL): data on rents, yields, vacancies for a number of British locations and all the continental European ones we and prime rent and equivalent yield data from 1990 to 2005 (continental European cities) and for 1987 to 2005 (British cities)</li> <li>▫ Office of the Deputy Prime Minister (ODPM): vacancy rate information from the</li> <li>▫ Investment Property Databank (IPD): national rental void (vacancies) data from</li> </ul>
<b>Experimental set-up</b>	Regulatory tax is equal to market value of an additional square metre of office space divided by the marginal construction costs of adding one square metre of additional floor
<b>Hypothesis</b>	The regulatory tax in the UK is higher when compared to other countries even when considering locations outside London
<b>Robustness</b>	Some imputation of missing values required but overall the approach is relatively simple and therefore robust.
<b>Key findings</b>	The regulatory tax rates in the City of London can be compared to other large European cities. For example, in 2005 the regulatory tax in the City of London is estimated at 8.89% compared to Frankfurt (3.31%), Stockholm (3.30%) and Milan (4.11%).
<b>Limitations</b>	The approach does not consider the net impact of planning regulations.

**Article**

Damiani, M., Pompei, F., (2010), Labour protection and productivity in EU economies: 1995-2005, European Journal of Comparative

## Annexe 3: Detailed overview of selected empirical evidence

<b>Data</b>	<p>Economics, Vol. 7, n. 2, pp. 373-411</p> <p>EU KLEMS accounts (MFP data), EUROSTAT (rate of change of employees with fixed-term and with part-time contracts and the rate of growth of weekly hours worked) and OECD databases (product market regulation indicators).</p> <p>Due to data availability the following countries were included: Austria, Belgium, the Czech Republic, Denmark, Spain, Finland, France, Germany, Hungary, Ireland, Italy, the Netherlands, Portugal, Slovenia, Sweden, and the United Kingdom.</p> $\Delta \ln MFP_{st} = \Lambda_{ijt}^z LP_{it}^z + OV_{st}^n + R \& D_{st} + PMR_{st} + D_{st} + D_{it} + \varepsilon_{st}$
<b>Experimental set-up</b>	<p>The change in multi-factor productivity in 128 sector-country units (s) over 10 years (t from 1995 to 2005) is driven by index on the size of the labour flexibility component which is protected (<math>\Lambda</math>) interacted with a measure of labour protection (LP), organisational variables (OV), unmeasured innovative inputs (R&amp;D), product market regulation (PMR), industry-by-time dummies (D) and country-by-time dummies (D).</p>
<b>Hypothesis</b>	<p>Differences in flexible employment contracts and collective labour relationships can explain the ample MFP differentials recorded in the European economy.</p>
<b>Robustness</b>	<p>Large proportion of variables tested are not significant, conclusions only based on significant variables.</p>
<b>Key findings</b>	<p>It seems likely that shorter term jobs and lower employment tenures discourage investments in skills, while labour regulation which sustain long term relationships, may present some advantages and would seem to be preferable to short-term arrangements in collaborative relations and bargaining governability.</p>
<b>Limitations</b>	<p>Inaccuracies associated with EU KLEMS dataset and measurement of regulatory indices</p>

<b>Article</b>	Gorgens, T., Paldan, M. Wurtz, A., (2005), Growth, Income and Regulation: a Non-Linear Approach
	Fraser Institute of Economic Freedom Index
<b>Data</b>	From International Bank for Reconstruction and Development: Average real growth per capita Log GDP per capita in PPP prices
	Semi-parametric estimation of fixed effects panel data regression model
<b>Experimental set-up</b>	The regression function models expected growth conditional on the choice of regulation, fixed effects for countries and for years and the log GDP level
<b>Hypothesis</b>	The relationship between regulation and growth is not linear
<b>Robustness</b>	Includes 95% bounds which show that the form of the curve on the right (at higher levels of regulation) is statistically significant but on the left (at lower levels of regulation) it is not statistically significant
<b>Key findings</b>	Aerts, Claeskens and Hart test for linearity 0.870, not rejected as 5% critical value is 4.18
<b>Limitations</b>	Use of Fraser Institute of Economic Freedom Index to measure overall regulation as it includes a range of government interventions that may not necessarily be defined as regulation

<b>Article</b>	Griffith, R., Harrison, R. and Simpson, H., (2010), "Product Market Reform and Innovation in the EU", <i>Scandinavian Journal of Economics</i> , Volume 112, pp 389-415
<b>Data</b>	<p>OECD data on 12 EU countries between 1985-2000</p> <ul style="list-style-type: none"> <li>□ Profitability measured as value-added as a share of labour and capital costs</li> <li>□ Innovation activity measured as Business Enterprise R&amp;D expenditure, as percentage of GDP, from OECD ANBERD database</li> </ul> <p>2-stage instrumental variables specification, with linear functional form for both equations</p> <ul style="list-style-type: none"> <li>□ gives reduced-form impact of PMR on intensity of innovation (measured as R&amp;D spend as a share of value-added)</li> </ul>
<b>Experimental set-up</b>	<p>First-stage regression: <math>\mu_{ijt} = PMR_{ijt} \beta_{PMR} + \alpha_{it} + \eta_{jt} + e_{ijt}</math></p> <p>where <math>\mu_{ijt}</math> is average profitability for industry <math>i</math> in country <math>j</math> at time <math>t</math></p> <p><math>\alpha_{it}</math> and <math>\eta_{jt}</math> are industry-time and country-time fixed effects, respectively, and <math>e_{ijt}</math> is the residual.</p> <p>Second-stage regression: <math>innov_{ijt} = \beta_{\mu} \mu_{ijt} + \alpha_{it} + \eta_{jt} + u_{ijt}</math></p> <p>where <math>innov_{ijt}</math> is innovation activity for industry <math>i</math> in country <math>j</math> at time <math>t</math></p>
<b>Hypothesis</b>	<p>Reduced product market regulation increased competition (ie reduced average profitability <math>\mu</math>), which increases innovation and TFP</p> <ul style="list-style-type: none"> <li>□ <math>\beta_{PMR}</math> is negative</li> <li>□ <math>\beta_{\mu}</math> is negative</li> </ul>
<b>Robustness</b>	<p>The paper offers solid evidence of a negative relationship between the degree of product market regulation and the intensity of competition. Use SMP as a 'natural experiment' to address endogeneity concerns</p>
<b>Key findings</b>	<p>The Single Market Programme (SMP) reduced profitability in regulated markets with high price dispersion and a broad range of consumer and intermediate goods:</p> <ul style="list-style-type: none"> <li>□ A one-percentage point decrease in profitability increases R&amp;D intensity by 0.45 percentage points</li> <li>□ A one-percentage point increase in R&amp;D intensity raises TFP growth by 0.6 percentage points.</li> </ul>

### Annexe 3: Detailed overview of selected empirical evidence

**Limitations**

Estimates are specific to SMP reforms in affected industries in affected countries and cannot be extrapolated to future reforms or other industries.

"Administrative burden on business," our main variable of interest measured as "time senior management spends with government bureaucracy" from Fraser Institute (based on survey responses from WEF Global Competitiveness Report) or "Percentage of SMEs for which administrative burdens are a problem" based on survey data from OECD International Regulation Database.

<b>Article</b>	Griffith, R. and Macartney, G., (2010) Employment Protection Legislation, Multinational Firms and Innovation, CEPR Discussion Paper No 7628
<b>Data</b>	European Patent Office PATSTAT dataset (patents), accounts from Amadeus database, index of EPL from OECD (preferred measure is the indicators of the legislation relating to regular contracts). Overall 1,378 subsidiaries of 343 multinational firms are included in the analysis.
<b>Experimental set-up</b>	$NPL_{ms} = \exp(\beta_2 EPL_c + \gamma \ln CITWP_{ms} + X_{ci} + \eta_m + v_{ms})$ <p>NPL is a weighted count of patents that gives a greater weight to patents that are more technologically advanced.</p> <p>EPL is the OECD index on employment protection legislation.</p> <p>CITWP is the count of all patents weighted by all citations made, to control for differences across patents in the amount of citations made.</p> <p>X contains a number of control variables such as capital per unit output, natural log of the capital per worker in each country, the skill intensity of each industry, the natural log of the proportion of GDP spent on higher education in each country, and the working population of each country averaged over the sample period.</p> <p><math>\eta</math> includes multinational effects.</p>
<b>Hypothesis</b>	<p>Multinational firms undertake more incremental innovation in high EPL countries and radical innovation in low EPL countries</p> <p>This is indicated by the sign and magnitude of <math>\beta_2</math> - a negative sign would indicate that higher technologically advanced patenting as a proportion of overall patenting is associated with lower EPL.</p>
<b>Robustness</b>	The results are significant at 10% significant level as a minimum. A range of tests for robustness are performed (including use of different EPL indicators).
<b>Key findings</b>	Multinational firms do more incremental patenting activity in high EPL countries and more radical patenting activity in low EPL countries
<b>Limitations</b>	The main limitation is the method of defining incremental and radical innovation.

### Annexe 3: Detailed overview of selected empirical evidence



<b>Article</b>	<p>Djankov, S., McLeish, C., Ramalho, R., (2006), Regulation and Growth, World Bank Working Paper</p> <p>World Bank Doing Business indicators for 135 countries and in seven regulatory areas converted into an aggregate index of business regulations</p>
<b>Data</b>	<p>World Bank Development indicators used for GDP and other growth factors such as primary and secondary school enrolment in the initial period, absolute deviation from average deflator in initial period, a binary variable for civil conflict, 3 regional dummies (Sub Saharan Africa, Latin America, East Asia), average government consumption as percentage of GDP over the 10 year growth Period</p> <p>OLS and 2-stage Regression analysis:  <math>Growth = \alpha + \beta \text{business regulations} + \gamma \text{Ln(GDPpc93)} + \delta X + \epsilon</math>,  Growth is the annual average GDP per capita growth between 1993 and 2002  X is a set of control variables</p> <p>A range of variations of the model were estimated as different growth factors were controlled for.</p>
<b>Experimental set-up</b>	<p>Main variations:</p> <ul style="list-style-type: none"> <li>▫ No growth factors included</li> <li>▫ Regional dummies included</li> <li>▫ School enrolment and average deflator included as well as regional dummies</li> <li>▫ Government consumption added</li> </ul>
<b>Hypothesis</b>	<p>Regulation has a negative impact on growth</p>
<b>Robustness</b>	<p>R-Square between 0.04 and 0.36</p> <p>Number of significant variables depends on model specification</p> <p>Business regulation index statistically significant at 5% in all OLS specifications, and statistically significant at 10% in all 2SLS specifications</p>
<b>Key findings</b>	<p>The relationship between more business-friendly regulations and higher growth rates is consistently significant in various specifications of standard growth models. Improving from the worst (first) to the best (fourth) quartile of business regulations implies a 2.3 percentage point increase in average annual growth.</p>
<b>Limitations</b>	<p>Possibility of reverse causality</p> <p>Use of high level indicators</p>

<b>Article</b>	Haskel, J. and Sadun, R., (2009), Regulation and UK Retailing Productivity: Evidence from Micro-Data, CEPR Discussion Paper No 7140
<b>Data</b>	<p>Micro data on retail firms and stores drawn from the official UK Office of National Statistics business surveys, including:</p> <ul style="list-style-type: none"> <li>▫ Interdepartmental Business Register</li> <li>▫ Annual Register Inquiry (ARI)</li> <li>▫ Annual Business Inquiry (ABI)</li> </ul> <p>SIC industry classification</p>
<b>Experimental set-up</b>	Regression of logarithm of gross output on standard store inputs, share of small and large stores, regional and industry dummies, dummy on whether store is part of a chain and fixed terms
<b>Hypothesis</b>	<p>A larger proportion of small stores reduces output at a chain level</p> <p>A greater proportion of employment in small stores reduces output at a chain level</p>
<b>Robustness</b>	Includes a range of robustness checks such as testing effects with vertical and horizontal integration
<b>Key findings</b>	In the absence of changes in supermarket store sizes, retail sector TFP growth would have been 0.44% per annum rather than the actual 0.07% per annum (between 1997/98 and 2002/03).
<b>Limitations</b>	<p>Some data limitations around accuracy of micro business data</p> <p>Analysis does not consider the net impact on growth</p>

### Annexe 3: Detailed overview of selected empirical evidence

<b>Article</b>	Poschke, M., 2010, "The Regulation of Entry and Aggregate Productivity", <i>Economic Journal</i> Volume 120, pp 1175-1200
<b>Data</b>	Data on administrative entry costs from Djankov (2002). Minimum cost of meeting entry requirements in largest city, measured as percentage of per capita GDP.  Other data from Groningen Growth and Development Centre's productivity level database (Inklaar and Timmer, 2008): TFP, labour productivity (output per hour), capital intensity (capital services flows per hour worked) for private sector in 1997, expressed in PPP terms relative to values for the US.
<b>Experimental set-up</b>	Dynamic stochastic model of heterogeneous firms, with technology choice. Firms produce intermediate goods under monopolistic competition. Set structural parameters of model and numerically solve for equilibrium values of key variables. Some parameters are evidenced from existing literature, others are jointly calibrated to values so that the model generates a distribution of firm productivity similar to that observed in the data. Then simulate policy experiments by changing particular structural parameters and numerically solve for new equilibrium values of key variables.
<b>Hypothesis</b>	Administrative entry costs reduce entry and productivity.
<b>Robustness</b>	The model replicates key features of the distribution of productivity across firms reasonably well, but is not able to capture the turnover of young and small firms (i.e. the survival rates of new firms are higher than those observed in the data).  Increasing administrative entry costs from 1.7% to 30% of per capita GDP accounts for one-third of the difference in Total Factor Productivity between Germany and the US.
<b>Key findings</b>	The relationship between administrative entry costs and total factor productivity is linear: introducing entry costs equivalent to an additional 10% of per capita GDP reduces TFP by 0.8%.
<b>Limitations</b>	The data is now fairly outdated and does not cover ongoing administrative costs to firms ("red tape") that are of particular concern to business groups. Moreover, administrative entry costs are measured for countries' largest city and may mask considerable variation within countries.  The author employs a sophisticated theoretical approach and advanced quantitative methods generally covered in PhD-level macro courses, and is unlikely to be accessible to readers with broader economic and policy backgrounds.



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URN 12/821