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Entry barriers and their macroeconomic impact in the EU: an assessment using QUEST III

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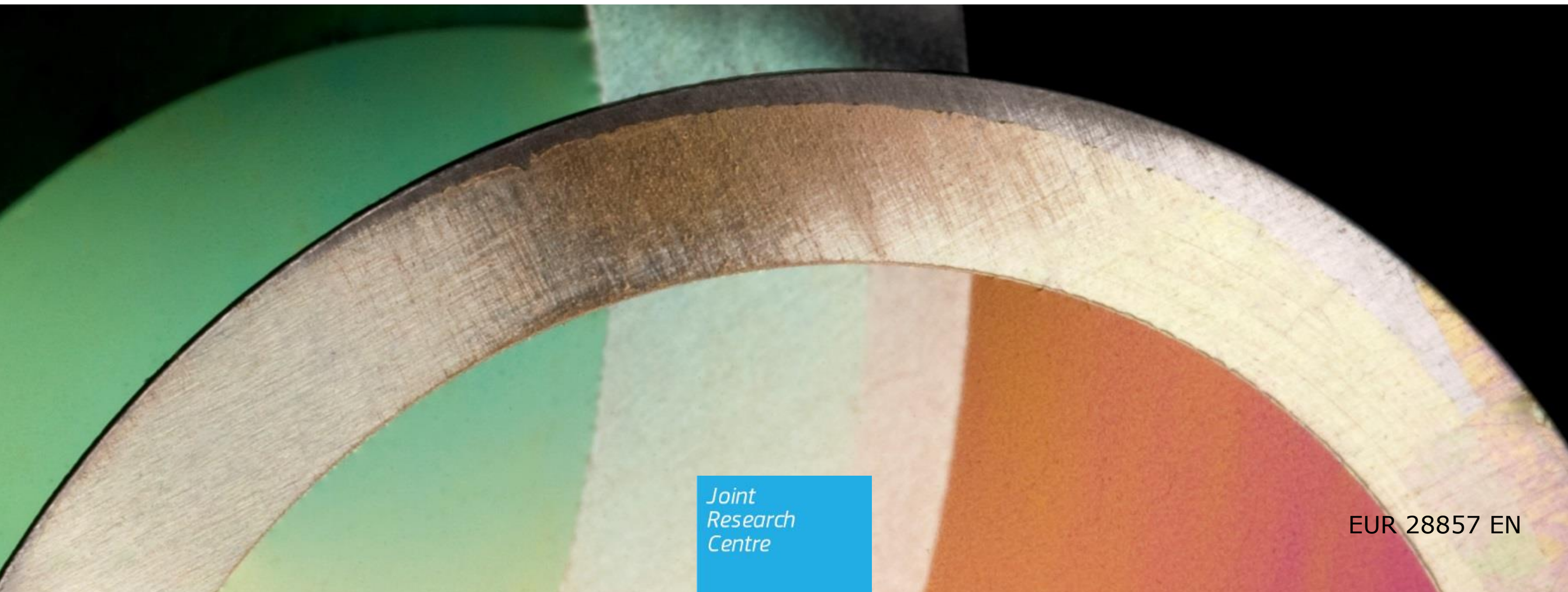

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Contents

Foreword

This publication is a Technical report by the Joint Research Centre (JRC), the European Commission’s science and knowledge service. It aims to provide evidence-based insights into the role and macroeconomic played by entry barriers across the EU, in order to support policymaking in this area. The scientific output expressed does not imply a policy position of the European Commission. Neither the European Commission nor any person acting on behalf of the Commission is responsible for the use that might be made of this publication.

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Abstract

Entry barriers make markets less contestable and thereby reduce competition, resulting in lower TFP, GDP and employment growth. Following the Lisbon strategy, Member States increasingly adopted measures to reduce the costs of starting a business. This paper quantifies the macroeconomic impact of such policies and identifies the main structural characteristics still driving the differences across Member States. In general, countries with high entry barriers and a less developed R&D sector seem to benefit proportionally more from a reduction of the so-called *red tape* barriers. Growth of GDP, TFP and employment could be further enhanced by also improving access to finance. Countries with a more developed R&D sector experience stronger growth in the long run when the reduction of the *red tape* barriers is accompanied by an improved access to finance.

1 Introduction

The entry of new firms to markets and the transformation of new ideas into marketable products are at the core of economic growth and higher productivity through the reallocation of resources from shrinking and exiting firms to new entrants and growing firm.[12] A study from the European Commission, covering FR, IT, DE, IE, PT, and ES over 1997-2003 period, estimated that a 1% increase in the entry rate of firms would increase GDP growth by 0.6% and employment growth by 2.67% based on data over the 1997-2003 period.[3]

Reflecting the importance of firm entry for a dynamic business environment, one of the main pillars of the Entrepreneurship 2020 Action Plan is to create a more dynamic business environment in which entrepreneurs can more easily execute their business ideas, flourish and grow. The Action Plan comprises a series of measures that, among other objectives, facilitate access to finance, reduce the regulatory burden to start and manage an enterprise, and ease bankruptcy procedures.

Following the launch of the Lisbon Strategy, most Member States began to reduce the costs of starting a business (see Ciriaci (2014, table III.2, t)[4]. Nevertheless, the levels of entry barriers are still very heterogeneous across Member States and some countries like IT, CY, MT, and PL have costs to start a business that are, relative to income per capita, up to 70 times higher than the best EU performers, i.e. DK, UK, and IE (Ciriaci 2014, Table III.1).[5] The OECD's (2015) indicator on product market regulation also shows countries' heterogeneity on barriers to entrepreneurship (see Figure 1).[6] Over time, most countries have made considerable progress in removing entry barriers, although this progress has slowed down since 2008. Hence, in several Member States policy makers still have space for significant interventions directed towards creating a more dynamic and competitive industry. As a result, policies in favour of SMEs, in particular policies that may create the conditions for the flourishing of the so-called High Growth Innovative Enterprises (HGIE) are receiving greater attention. Likewise, an important policy issue is to understand and measure the impact of policies aimed at reducing entry barriers.[7] Both large companies and Small- and Medium-sized Enterprises (SMEs) benefit from a reduction in entry barriers. However, large companies are often better able to cope with entry barriers than SMEs due to having access to a larger pool of resources, including easier access to finance. Consequently, policies aiming at a reduction of entry barriers notably aim at supporting SMEs and, in particular, young enterprises, as these are the type of firms most often deterred by entry barriers. This is a particularly important policy issue in order to increase productivity and growth, as most of the job creation by young firms is carried out by new firms entering the market

[1] For instance, Nicoletti and Scarpetta (2003) using a panel of 18 OECD countries between 1984 and 1998, were the first to estimate that lower entry barriers would result in a faster catch-up with the technology frontier. This is now widely established in the empirical literature.

[2] Several papers asses the growth contribution of the reallocation of resources from exiting to entering firms. For instance, Luttmer (2007) and Gabler and Licandro (2009) estimate that this selection effect can explain between 20% to 50% of US GDP growth. These estimates are consistent with Scarpetta et al. (2002) who find that entry and exit contributed to between 20% to 40% of aggregate productivity growth in a panel of OECD countries.

[3] See European Commission (2005), "Impact of market entry and exit on EU productivity and growth performance", European Economy 222.

[4] The World Bank definition of the costs of starting a business comprises three main elements; the number of procedures, the number of days and the cost as percentage of income per capita necessary to start a business. These are the so-called *red tape* entry barriers.

[5] For instance, the costs of starting a business as a percentage of income per capita is 0.2% in Denmark compared to 14.2% in Malta. Cross-country differences in entry barriers partially explain cross-country differences in the size of entering firms as shown by Bartelsman et al. (2005).

[6] The OECD developed a series of economy-wide indices to measure countries regulatory frameworks and their changes over time. The Product Market Regulation index is a synthesis of three indexes on state control, barriers to entrepreneurship, and barriers to trade and investment. See Nicoletti et al. (1999) for an explanation on how they are constructed. This ranking of countries differs with respect to the World Bank's *Doing Business* because of the different definition of entry costs used by the two institutions.

[7] At the European level, Sapir (2004) stressed that too much policy attention is paid to incumbent firms to ensure fair competition, whereas entrants and young firms tend to be neglected.

(Haltiwanger et al., 2013). Similarly, Criscuolo et al. (2014) in a study with 18 OECD countries estimate that the share of total employment creation due to SMEs that are less than three years old is quite high relative to their size (varying from 60% to around 28%, as shown in Figure 2 below).

Firm size is also closely related to business dynamics. The European Commission Product Market Review (2013) highlights a non-linear relationship between firm size at both entry and exit and an efficient allocation of resources between and within firms. In particular, they find that on average an increase in the size of a firm, when entering the market, of 1 employee is associated with an increase in efficiency by 1.6%. In addition such a relation exhibits an inverted U-shape, peaking with 10 employees at entry.[8] This indicates that policies that support an increase in the average size of small start-ups give rise to efficiency gains.

Figure 1 below shows the distribution of administrative burdens on start-ups and regulatory protection of incumbent firms across OECD countries in 2013. Figure 2 depicts the extent to which (young) SMEs contribute to job creation, destruction and employment in OECD countries.

Figure 1. Barriers to entrepreneurship in 2013 - source OECD (2015)

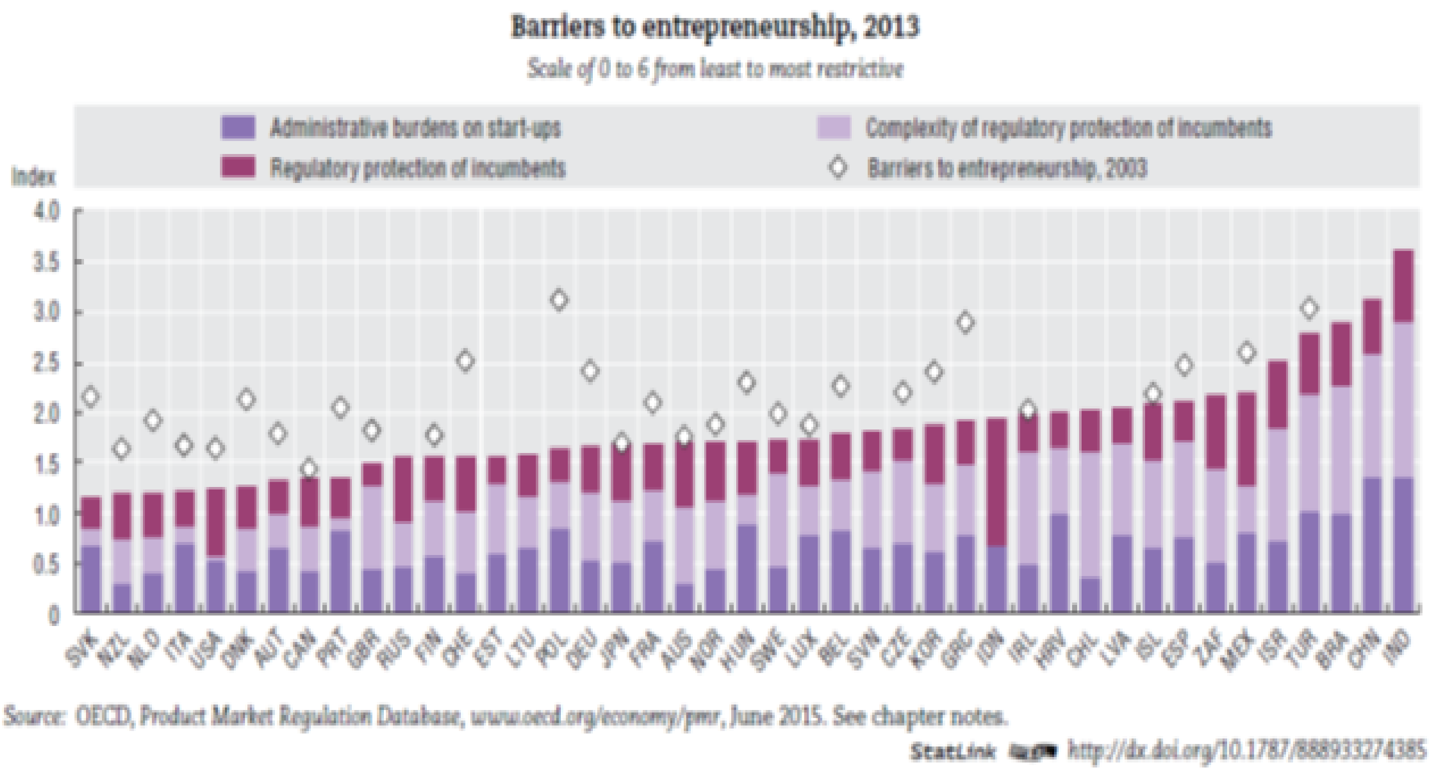
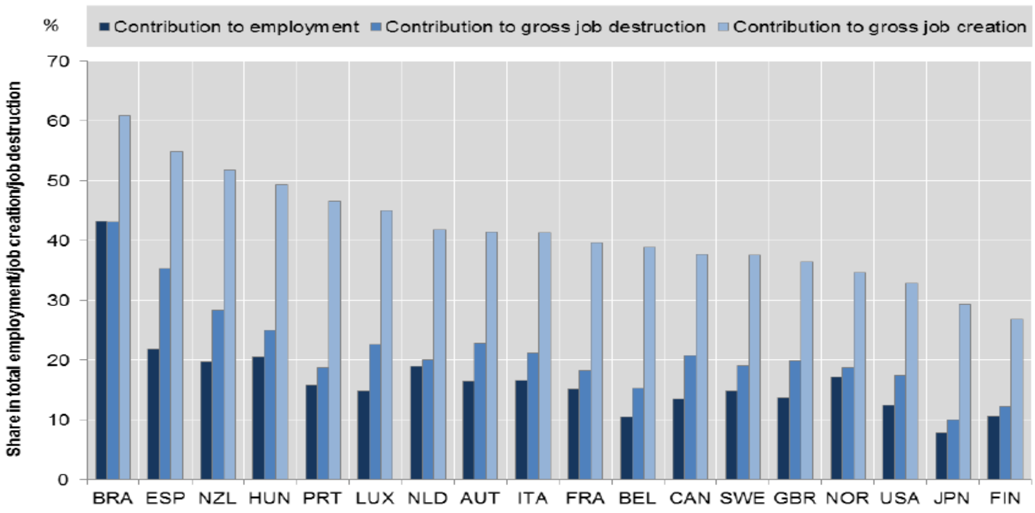


Figure 2. Young SMEs contribute disproportionately to job creation - source Criscuolo et al. (2014)

[8] The empirical analysis uses Eurostat data from 2000-2010 and includes most Member States.

Employment, gross job creation and gross job destruction by young small and medium sized firms, 2001-11



Note: The graph reports the contribution to total employment, gross job creation and job destruction by firms in the reported age-size groups in average across all available years and countries (see Type C measures in Table 5). The period covered is 2001-2011 for Belgium, Canada, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Spain, Italy, Luxembourg, Norway and Sweden; 2001-2009 for Canada, Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Sectors included are: manufacturing, construction, and non-financial business services. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level. Data for Canada refer only to organic employment changes and abstract from merger and acquisition activity.

Against this backdrop, this paper carries out a horizontal quantification across 17 Member States of the potential macroeconomic impact of a reduction in entry barriers in terms of fixed costs and financial constraints. This examination will be carried out using the European Commission's QUEST III model.[9] The goal is to combine qualitative and quantitative analysis to critically assess: (i) the role of entry barriers in Member States to determine GDP, productivity and employment, and (ii) structural characteristics that cause different magnitudes and persistence levels of the impact of an increase in product competition within countries. Hence, the paper will support the policymaking process by identifying the structural areas in which improvements can be made to foster a more dynamic business sector and, ultimately, economic growth.

2 Definitions and literature review

2.1 What are entry barriers?

The definition of entry barriers is a topic widely discussed in the literature. Although many definitions have been put forward, there is still disagreement on what exactly should be understood as entry barriers. Among the widest definitions is that proposed by Bain (1956 p. 3). He defines entry barriers as "advantages of established sellers in an industry over potential entrant sellers, these advantages being reflected in the extent to which established sellers can persistently raise their prices above a competitive level without attracting new firms to enter the industry".

A significant number of elements underlie Bain's definition. He stresses the importance of three barriers: (i) economies of scale, (ii) product differentiation, and (iii) absolute cost advantage. Economies of scale imply that when firms enter the market they are either too small, and hence face a fixed cost disadvantage with respect to incumbents, or they enter at an *efficient* scale leading to a depressing effect on prices. Product differentiation allows incumbents to charge higher prices than entrants for instance due to brand loyalty or advertising. Finally, an absolute cost advantage allows incumbents to sell profitably

[9] QUEST III is a Dynamic Stochastic General Equilibrium model developed by DG Economic and Financial Affairs (DG ECFIN).

below the costs of potential entrants. This may be due to a combination of economies of scale and brand loyalty or to know how and specific technologies developed by incumbents as well as Intellectual Property Rights and trademarks.

A much narrower definition is proposed by Stigler (1968 p. 67), who defines entry barriers as "a cost of producing (at some or every rate of output) which must be borne by a firm seeking to enter an industry but it is not borne by firms already in the industry". In other words, Stigler recognizes as entry barriers only the cost disadvantage due to entry regulations, i.e., the so-called *red tape* barriers. He also criticises the idea of scale economies and capital requirements as entry barriers. In his view, scale economies are not entry barriers if entrants and incumbents have equal access to technology. Similarly, capital requirements are not entry barriers unless incumbents never faced them.

Several authors have provided alternative definitions of entry barriers which are more or less restrictive but within the upper bound defined by Bain (1956) and the lower bound defined by Stigler (1968)[10]. New elements in the definition are included in Shepherd (1979) who distinguishes between exogenous and endogenous entry barriers. Exogenous barriers are intrinsic to the market and neither incumbents nor entrants are able to affect them. Some examples of exogenous barriers are government policies, incumbent cost advantages due to technology acquisition, R&D intensity, access to distribution channels, customers' switching costs, and entrants need for capital. On the other hand, endogenous barriers are a result of incumbents' competition and market strategies aimed at impeding firm entry, e.g. advertising, aggressive marketing strategies and predatory prices. Exogenous and endogenous barriers may amplify each other, thereby increasing their respective impact on markets' competitive structure and dynamics.

McAfee et al. (2004) suggested an even wider definition than Stigler's by positing that "an economic barrier to entry is a cost that must be incurred by a new entrant and that incumbents do not or have not had to incur". This means that entry barriers can also include costs, such as brand loyalty, that are not labelled as *red tapes*. Additionally, the authors distinguish between *primary* entry barriers such as IPR or brand loyalty and *ancillary* barriers that are not barriers per se but reinforce other potential barriers to entry such as economies of scale.

The academic debate around entry barriers and their definition has not always addressed practical issues in support of actionable policy measures. This void has been filled by guidelines developed by the countries' competition enforcement agencies. For instance, the European Guidelines on the Assessment of Horizontal Mergers (2004) defines entry barriers as "specific features of the market, which give incumbent firms advantages over potential competitors". This is a broad definition that includes three main types of barriers: (i) technical advantages such as preferential access to natural resources, innovation and R&D, IPR, access to technology, economies of scale and scope, distribution and sales networks; (ii) legal advantages such as a restricted number of licences, tariff and non-tariff trade barriers; (iii) barriers resulting from the established market position of the incumbents such as advertising costs, brand loyalty, reputation, and customer switching costs.

2.2 How are entry, exit and entry barriers modelled in macroeconomics? A theoretical perspective

The macroeconomic debate on entry barriers is focused on their impact on firm turnover, entry-exit dynamics at the industry level, and how these affect innovation incentives, and thereby the main macroeconomic aggregates, such as TFP and GDP growth. Given the importance of firm entry and exit as a link to connect entry barriers and economic growth, the following discussion revolves around models of firm dynamics.

[10] For instance, see Ferguson (1974), Fisher (1979), Weizsacker (1980), Gilbert (1989) and Carlton and Perloff (1994).

The literature modelling entry and exit and their macroeconomic impact is based on the Schumpeterian concept of *creative destruction* (Schumpeter, (1942)). [11] The key idea is that growth is driven by new innovations or product varieties that replace old technologies or varieties. In this sense, entry and exit play an important role since they facilitate innovation by transferring resources from less to more productive firms. This reallocation is known as *selection effect* and generates *between productivity growth.* This is different from the so-called *within productivity growth,* which refers to the increase in firm productivity because of factors intrinsic to individual firms, such as the acquisition of new technologies or restructuring as a response to entrants' competitive pressure.

There are four main types of models dealing with entry and exit: (i) passive learning models, (ii) active learning models, (iii) vintage capital models, (iv) life-cycle models. Jovanovic (1982) introduces the first model of passive learning in which heterogeneous firms enter the industry, after incurring a sunk entry cost, without knowing their true cost. Firms are subjected to productivity shocks, learning over time about *true* productivity. Efficient firms stay in the market, inefficient ones exit. Survivors exhibit a larger size and higher growth rates than exiting firms and the model converges to an equilibrium featuring no entering and exiting of firms. The seminal contribution of Hopenhayn (1992) represents a major step forward in the literature on heterogeneous firms and entry and exit by allowing for an equilibrium in which entry and exit are positive, and by taking into account industry characteristics (e.g., entry barriers, demand, and productivity shocks) affecting firm turnover and the industry's productivity distribution.

In the models of active learning, such as Ericson and Pakes (1995) and Lentz and Mortensen (2008) a firm enters the market by paying a sunk cost and actively invests in innovation to increase its productivity. The success of its investment depends on whether its competitors manage to realize successful investments. When the firm is unsuccessful, in terms of productivity and relative to the other firms, this leads eventually to the exit of the firm from the market.

Campbell (1998) proposes an alternative model based on vintage capital in which new technology is embodied in more recent vintages. In these types of models, entry is key for the adoption of new technologies and thus high entry barriers hinder their adoption. Similarly, in the models of Aghion and Howitt (1992) and Grossman and Helpman (1992) potential new firms invest in R&D to upgrade or create new varieties and when successful they enter the market, thereby replacing existing firms. In these models, innovation investments are often equivalent to entry costs.

Finally, Klepper (1996) models firm entry over the product cycles. In this class of models, entry, exit and innovation depend on the maturity of the industry. Young industries display high turnover and innovation, which slows down as the maturity of the industry increases.

More recent models with firm heterogeneity include Peretto (1996) and Impullitti and Licandro (2016). These papers present endogenous growth models where a reduction in entry costs increases the number of firms in the industry, thereby reducing (variable) price markups. This *pro-competitiveness* effect of lower entry barriers raises static efficiency, and by increasing the market size of surviving firms, it also promotes the incentives for these firms to invest in innovation, leading to higher aggregate productivity growth.

Regarding the effects of entry barriers on unemployment, Felbermayr and Prat (2011) show, in the same modelling framework with heterogeneous firms, that product market regulations (PMR) can condition average aggregate productivity in the economy by sheltering unproductive firms from competition. But these regulations might as well force these firms out of the market too. Thus, the sign of the effect depends on the nature of

[11] Schumpeterian growth theory was firstly formalized in a tractable model in the seminal work of Aghion and Howitt (1992). Similar models of Schumpeterian growth have been also developed by Segerstrom et al. (1991) and Grossman and Helpman (1991).

the PMR. When regulations increase barriers to entry, the lower competitive pressure faced by entrants allows incumbent less productive firms to remain in the market, thereby reducing average productivity and increasing the unemployment rate. On the other hand, when PMR increase fixed operating costs, less productive firms will be forced to leave the market, increasing productivity and reducing unemployment.

A common characteristic of these models is that entry barriers are modelled as sunk costs, i.e. irreversible costs that are paid only once upon entry, thus affecting only the entry decision, and that cannot be recovered in the event of exit. That is, potential entrants compare the cost of entry with the present discounted value of future profits and enter the market only if the latter is greater or equal to the initial cost. In endogenous growth models, entry costs are often interpreted as an investment in innovation that with some probability will materialize in a new (horizontal innovation) or better (vertical innovation) product that may either add to or displace existing ones.[12] [13] In equilibrium, the so-called *free entry condition* holds: firms will be willing to pay sunk costs until they are equal to the present discounted value of future profits.

From a more general theoretical point of view, the relationship between entry rates and growth is not straightforward. On the one hand, a decrease in entry barriers (modelled as a decrease in sunk entry costs) induces more firms to enter the market, increasing competition and thus tends to positively affect the equilibrium growth rate. On the other hand, it requires a reallocation of resources (labour) from incumbents to entrants. This reduces the resources available to incumbents, negatively affecting their profitability and innovation intensity. This channel thus tends to reduce the aggregate equilibrium growth rate instead. Moreover, the erosion of incumbents' profitability translates into a lower expected profit for entrants impacting negatively on the number of entrants. This trade-off is present for instance in Acemoglu and Cao (2015) and Acemoglu et al. (2015). In particular, they find that a subsidy to entry results in only a marginal increase in U.S. GDP, whereas the combination of a policy that incentivizes innovation by both incumbents and entrants financed by a tax on the operational costs of incumbents can have relevant growth effects (in the order of 3.1%). On the contrary, subsidizing only incumbent R&D would significantly reduce growth because it deters entry of high-quality firms and therefore reduces the selection effect.

2.3 Overview of the empirical literature on the impact of entry barriers

The recent availability of firm-level data in several countries has stimulated a growing body of empirical literature that studies the effect of entry barriers on firm entry and growth as well as the impact of policies designed to favour entry and a more competitive economy. Using a panel of ten OECD countries Bartelsman et al. (2005) find that about 20% of firms enter and exit every year in each country and that these firms can be of different sizes. Moreover, the authors observe that successful start-ups grow faster in the U.S. than in Europe due to lower entry barriers, which leads in turn to higher competition, productivity and growth of firms. Klapper et al. (2006) working on a panel of 71 countries confirm a significant negative correlation between entry barriers, intended as entry regulations, and firm entry and business density. This correlation is especially strong in countries with a stable political climate and good governance.

[12] This branch of the endogenous growth literature focuses on the competitive and dynamic nature of innovation driven by firm's incentives to invest in R&D. This approach takes into account the positive externality that current innovations have on future progress and also the negative externality for rivals who lose their market share or are forced to exit the market. The latter externality is known as the *business stealing effect* which, when not internalized by the private or public sector, could lead to market inefficiencies raising important questions for the policy maker. The business stealing effect is also related to the *replacement effect* discussed firstly by Arrow (1966). He argues that when a monopolistic incumbent innovates he partly replaces his own monopoly rents. This gives an advantage to a potential entrant who will invest more because it does not have pre-existing rents to replace.

[13] In these models, vertical innovation can often be interpreted either as process or as product-quality innovation. Horizontal innovation can be interpreted as new product varieties.

Nicoletti and Scarpetta (2003) are the first to consider the impact of a reduction in entry barriers on productivity growth across 18 OECD countries and 23 industries between 1984 and 1998. Their focus is on the impact of product market deregulations that affect entry and on privatization policies. In particular, they estimate that lower entry barriers would result in a faster catch-up with the technology frontier in the manufacturing industry, but also that the catch-up is slower the shorter the distance to the frontier. Hence, entry liberalization increases productivity growth especially in countries that lie relatively far from the technology frontier.

A recent OECD study (Bravo-Biosca et al. (2013)) attempts to explain cross-country differences in firm growth dynamics. Using data on ten OECD countries, the authors observe that dynamic and growing industries are associated with higher financial development, stronger competition in the banking sector and better contract enforcement. For our purposes, their findings imply that difficulties in access to capital constitute a very important barrier to entry and to growth for start-ups. Policies that hinder industry dynamics include strong employment protection legislations and high R&D fiscal incentives, which constitute advantages for incumbents.

Overall, the empirical literature confirms that market deregulation positively affects productivity and employment (See Djankov (2008)).[14] However, the reach of this measure depends crucially on country-specific characteristics such as industry structure, legislation and institutional make-up.

3 The macroeconomic impact of Entry Barriers in Member States: a quantitative analysis using QUEST III

QUEST III is a DSGE (Dynamic Stochastic General Equilibrium) model. It was originally developed by the Directorate General for Economic and Financial Affairs (DG ECFIN) for the analysis of fiscal and monetary policies, but the model has ever since been extended in various ways. It has been calibrated for 28 Member States as a "three country model".[15]

We proceed by simulating two scenarios for each Member State. First, we analyse the impact of a reduction of the value of fixed entry costs corresponding to 0.1% of GDP per capita. In a second simulation exercise, we add to the reduction of fixed costs, a reduction of the risk premium for intangibles proportional to the degree of dispersion of this parameter in the sample of 28 Member States. The analysis of the differences in outcomes for the individual Member States sheds light on how different macroeconomic contexts impact on the effectiveness of a reduction in entry barriers and improved access to finance.

However, this approach has a number of drawbacks. First, the current version of QUEST III models innovation as being dependent on R&D through the patents generated by R&D. Thus, it does not account for investments and innovations which do not result in patents. This is a somewhat limited view of both R&D and innovation. Second, for long time horizons the simulations are likely to underestimate the impact of R&D, because the model cannot very well account for break-through innovations. Third, the conclusions will depend on how well the model reflects the transmission mechanisms in the individual Member States. Fourth, some Member States have already made considerable progress on entry barrier reductions and have well developed financial systems. For these Member States further improvements are likely to be small due to low marginal returns of further

[14] Djankov (2008) reviews 201 papers published in refereed journals studying the link between entry regulation and entrepreneurship, productivity and corruption. He concludes that there is an important and statistically significant positive relationship between deregulation, on one side, and entry rates and productivity, on the other.

[15] i.e. the model distinguishes between the particular Member State being modelled, the rest of the Euro Area (EA) and the rest of the world outside the EA (including the rest of the EU).

improvements. Fifth, there may be a discrepancy between the estimated entry barriers in the model and the actual entry costs faced by individual firms which depend on size, geographical location and other country specific characteristics which the model does not account for. Still, with these caveats in mind, as we are mainly interested in highlighting the macroeconomic factors impacting the effectiveness of entry barrier reductions in combination with improved access to finance, the cross-country comparison made below is interesting, since, as also pointed out in Bravo-Biosca et al. (2013), it highlights the potential for further improvements across countries.

The sections below discuss how entry barriers are modelled in QUEST III and the mechanisms through via which a shock to entry barriers impacts GDP, employment and productivity. The typology and magnitude of entry barriers are country-specific and often a heritage of countries' past legislations, economic structures and institutions. As a consequence, to understand their impact on entrepreneurship and industry dynamism it is necessary to frame them in the context of each Member State. In the next subsections, we discuss and analyse the main mechanisms behind the propagation of entry barriers shocks as well as the results of simulating the macroeconomic impact of a policy reform addressed to reduce such barriers. We then provide an explanation of the cross-country differences based on the fundamentals of each Member States' economy.

3.1 Entry barriers and risk premia in QUEST III

As The treatment of entry barriers in QUEST III is very similar to the approach followed in the entry and exit models discussed in the previous section. In particular, QUEST III models entry barriers as sunk costs paid by intermediate firms upon entry (see for instance, Jovanovic (1982) Hopenhayn (1992), Ericson and Pakes (1995) and Lentz and Mortensen (2008)). This is a good way to represent the administrative burdens that firms bear upon entry, but it is only a simplified representation of entry barriers as such, because it does not explicitly consider issues such as market structure or the technological advantages of incumbents.[16]

Access to capital is modelled separately from the cost of entry. Start-ups are often constrained by limited access to capital, which impacts negatively on their birth rate (European Commission, (2013)). This is particularly severe in some Member States, such as Malta, Lithuania and Romania. Hence, an improved access to finance could in principle reinforce the impact of a reduction in entry barriers. In the case of QUEST III, financial constraints can be partially captured by a risk premium on intangibles. This risk premium can be interpreted as a proxy of a country's financial development: when the degree of financial development in a country is low (high) an investor has few (many) opportunities to diversify their portfolio, and thus, the risk borne by them are higher (lower). This is reflected in a high (low) value of the (calibrated) risk premium.

In QUEST III, both entry costs and the risk premium are modelled as sunk costs that are ultimately borne by intermediate good firms in equilibrium. Changes in these two parameters show commonalities in their transmission mechanisms. A reduction of entry barriers stimulates entry in the intermediate sector and the demand for new patents. This leads to an increase of R&D activities and hence a reallocation of high-skilled workers from the production sector to the R&D sector, which explains a short-term reduction in GDP and a long term increase in real wages. Over time, the enhanced productivity effect of heightened innovation outweighs the effect of the outflow of high-skilled workers, yielding a net increase in TFP and, hence, GDP. Employment reacts positively on impact due to a higher demand for high-skilled workers from the R&D sector and then, as real wages increase, the size of this effect gets progressively reduced.

The key equation via which these two parameters enter the model is the free entry condition of intermediate firms. Free entry means that intermediate firms will enter the

[16] Out of all the definitions of entry barriers presented in the previous section, this definition is arguably more in line with Stigler's (1968) definition,

market and thus buy new patents until the value of profits in a given period equals the entry costs plus the net value of patents. That is,

$$PR_t^x = \frac{i_t^A P_t^A}{DEF_t} + FC_A(i_t^A + C_t^A),$$

where the relevant variables are: the level of entry costs, FC_A, the profit earned by design/firm x, PR_t^x, the price for licencing a patent, P_t^A, the GDP deflator, DEF_t and the user cost of intangible capital, i_t^A.[17] This equilibrium equation shows that high entry barriers must be compensated for by high expected profits or by a lower licencing price for the patent, or by a combination of both, for the decision to enter the market to be economically feasible.

Profits of intermediate firms are positively related to the inverse of the mark-up charged by final good producers, η_t^y, and negatively related to the numbers of patents issued, A_t:

$$PR_t^x = \left(\frac{1-\theta}{\theta}\right)\frac{i_t^k P_t^c x_t}{DEF_t} = (1-\theta)\frac{p_t^x x_t}{DEF_t} = (1-\theta)\frac{\eta_t^y(1-\alpha)(Y_t+FC_Y)}{A_t\, DEF_t},$$

where θ is the elasticity of substitution between intermediate good inputs in the final good production function, α is the fixed-cost-adjusted elasticity of labour in final good technology, Y_t is aggregate output from the final good sector, FC_Y are fixed costs in final good production, i_t^k is the user cost of capital, P_t^c is the price index of final goods, and DEF_t is the GDP deflator in year t. As each intermediate firm buys only one patent to produce one intermediate product, the number of patents equates the number of intermediate firms and represents, together with the mark-up, a measure of market competition. It follows from the previous equation that the more concentrated markets are, the higher the profits for each intermediate producer.

The price of patents, determined optimally in the R&D sector, is positively related to the unit labour cost of researchers and inversely related to the elasticity of R&D with respect to research labour, λ:

$$P_t^A = \frac{DEF_t}{\lambda}\frac{W_t^H L_{A,t}}{\Delta A_t} + MADJ_t,$$

where $\Delta A_t = \nu_t A_{t-1}^{\varphi} L_{At}^{\lambda}$ is the new knowledge (patents) produced in period t using research labour, $L_{A,t}$, and the domestic stock of knowledge, A_t, with ν_t representing the efficiency level of the R&D production function, $W_t^H$the wage paid to high-skilled workers and where $MADJ_t$ stands for the marginal adjustment costs incurred by the firm when employing one more researcher.[18] Lastly, φ represents the elasticity of the current domestic stock of knowledge with respect to the past of domestic stock of knowledge.

An important variable affected by the risk premium is the user cost of intangible capital, i_t^A.

$$i_t^A = \frac{(1-\tau^A)\left(1+i_t-\left(1+g_{P_A}\right)(1+\pi_{t+1}^A)(1-\delta^A)\right)-t^K\delta^A}{(1-t^K)} + rp_t^A + \varepsilon_t^{rp^A}$$

where rp_t^A and $\varepsilon_t^{rp^A}$ represent the risk premium and the shock associated with it, respectively. It follows that a positive shock to the risk premium impacts the user cost of capital positively and linearly. In the combined entry barrier and risk premium shock discussed in section 3.2.2. below, the shock parameter $\varepsilon_t^{rp^A}$ is lowered.

Substituting the expressions for the profits of intermediate firms, the price of patents and the knowledge production function into the free entry condition, we can rewrite the latter as follows:

[17] C_t^A is an auxiliary term related to the change of the price of patents over time.

[18] The efficiency level ν_t depends, among other things, on the foreign stock of R&D of each country's main trading partners.

$$(1-\theta)\frac{\eta_t^{y}(1-\alpha)(Y_t+FC_Y)}{A_t\, DEF_t} = i_t^A\left(\frac{W_t^H L_{A,t}}{\lambda\, \nu_t A_{t-1}^{\varphi} L_{At}^{\lambda}} + \frac{MADJ_t}{DEF_t}\right) + FC_A(i_t^A + C_t^A).$$

This equation shows the most important structural parameters and variables affecting the net impact and transmission of shocks to entry barriers, namely, fixed entry costs, FC_A, the elasticity of R&D with respect to research labour, λ, the efficiency of the R&D production function, ν, and the share of high skilled workers devoted to research, $L_{A,t}$.

The structural parameters of the model are of particular importance as they capture the fundamental or *deep* characteristics of each economy. They are time invariant and can be shocked to understand how the variables in the economy would change as a reaction to a change in the economic fundamentals. For instance, a proportional shock to entry costs will impact Member States unevenly and the differences can be explained in turn by differences in the values of structural parameters. Hence, the understanding of such parameters is key to explaining the model transmission mechanisms and cross-country differences.

Entry costs are directly calibrated following the methodology developed by Djankov et al. (2002), who estimate the costs that new firms need to incur before starting to operate. [19] In contrast, the calibration of the parameters of the knowledge production function results from the restrictions imposed on the equilibrium equations of the model to ensure the existence of a balanced growth path. In particular, λ is obtained from available data on the wage share of R&D labour in total R&D spending whereas ν_t is directly derived from the knowledge production function after estimating the other elasticities, normalizing the initial stock of domestic and international knowledge, calibrating the growth rate of ideas and initializing the share of research labour.[20]

3.1.1 QUEST III simulations

In QUEST III, high entry barriers preclude some intermediate good producing firms from entering the market. This results in a low demand for patents and a low level of intangible capital. As a result, the marginal productivity of intangible capital is higher than in an equilibrium with more patents, due to decreasing returns to the accumulation of ideas. *Ceteris paribus*, a shock that reduces entry barriers yields higher output effects the higher the marginal productivity of intangible capital, i.e. the higher the initial level of entry barriers. A similar argument holds for the share of research labour. High entry barriers are associated with a small share of labour devoted to research and hence with relatively high marginal productivity of labour, again owing to diminishing returns. This also means that the effect on output will be larger when entry barriers are reduced. In both cases the output effect is amplified by higher R&D efficiency levels, ν, and higher elasticities of R&D with respect to researchers. These considerations constitute a starting point to understand cross-country differences in the propagation of shocks to entry barriers. Differences in the magnitude of impacts are better understood by investigating the role played by the different variables and parameters involved. Table 1 reports the values of key structural parameters and the initial steady state values of key variables for each Member State.

Table 1. Cross-country values of selected parameters and initial steady state values of key variables

[19] In particular, the authors carry out a very thorough data work to construct a measure of the regulation of entry (expressed in GDP per capita terms) across a very large number of countries based on costed measures of the total number of procedures and the time it takes to complete them as well as the actual administrative costs incurred (e.g., registration fees). For a detailed discussion, please see Djankov et al. (2002).

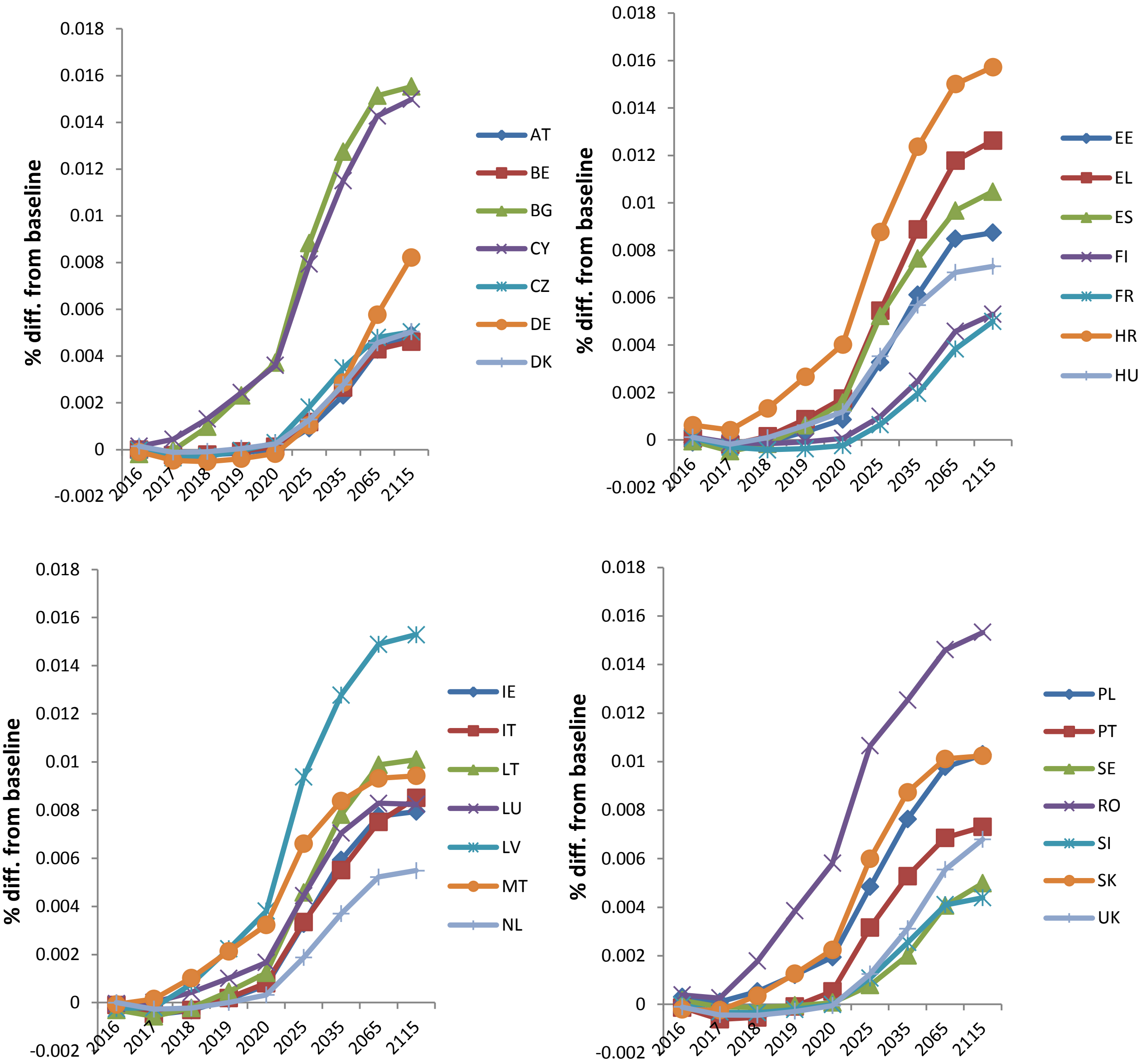
[20] For a more detailed explanation of the parameter calibration and estimation procedure, see D'Auria et al. (2009).

	FC_A	rp_A	λ	ν	R&D intensity (% GDP)	$L_{A,0}$
AT	0.063	0.006	0.398	0.213	0.034	0.012
BE	0.060	0.005	0.465	0.309	0.027	0.010
BG	0.054	0.075	0.645	1.282	0.009	0.004
CY	0.144	0.057	0.551	1.077	0.006	0.002
CZ	0.100	0.015	0.496	0.484	0.022	0.010
DE	0.048	0.006	0.496	0.298	0.032	0.012
DK	0.011	0.003	0.473	0.255	0.036	0.016
EE	0.022	0.035	0.482	0.416	0.016	0.007
EL	0.058	0.044	0.652	1.301	0.010	0.004
ES	0.090	0.044	0.777	1.745	0.014	0.007
FI	0.049	0.0009	0.441	0.231	0.036	0.015
FR	0.019	0.007	0.526	0.404	0.026	0.010
HR	0.064	0.067	0.672	1.598	0.009	0.004
HU	0.084	0.028	0.595	0.776	0.016	0.006
IE	0.016	0.035	0.569	0.580	0.017	0.008
IT	0.153	0.021	0.777	1.752	0.015	0.007
LU	0.046	0.031	0.594	0.659	0.014	0.008
LT	0.015	0.045	0.582	0.751	0.011	0.006
LV	0.030	0.073	0.738	2.027	0.008	0.005
MT	0.179	0.043	0.773	2.091	0.009	0.006
NL	0.057	0.017	0.547	0.431	0.022	0.011
PL	0.196	0.029	0.542	0.738	0.011	0.004
PT	0.028	0.034	0.773	1.700	0.015	0.007
RO	0.041	0.069	0.879	7.658	0.004	0.002
SE	0.025	0.0003	0.335	0.152	0.040	0.014
SI	0.016	0.008	0.477	0.331	0.028	0.011
SK	0.045	0.046	0.685	1.439	0.010	0.005
UK	0.013	0.015	0.495	0.363	0.019	0.010

3.1.2 Policy scenario I: lower entry costs

The first policy scenario, simulated individually for each Member State, is a reduction in the value of fixed entry costs for intermediate firms equal to 0.1% of GDP.[21] In each simulation, the shock is applied to the fixed costs of a given country only; the other Member States and the rest of the world are only indirectly affected via trade and financial links.[22] The following graphs show the impulse response functions (IRF) of GDP, employment and TFP for the 28 Member States.

Figure 3. Response of GDP to a reduction in fixed costs equal to 0.1% of GDP



[21] Even though the original entry barrier costs are calculated in GDP per capita terms in Djankov (2008), all quantities in the model are expressed in terms of GDP (which is the numeraire). Hence the reason for the choice of the size of the shock in GDP terms instead of GDP per capita.

[22] The version of QUEST III model that is used for the simulations is a three-country model characterizing an individual Member State versus EU27 and the rest of the world. Thus, it is not possible to study cross-country interactions or spillovers generated by common deregulation policies.

Figure 4. Response of aggregate employment to a reduction in fixed costs equal to 0.1% of GDP

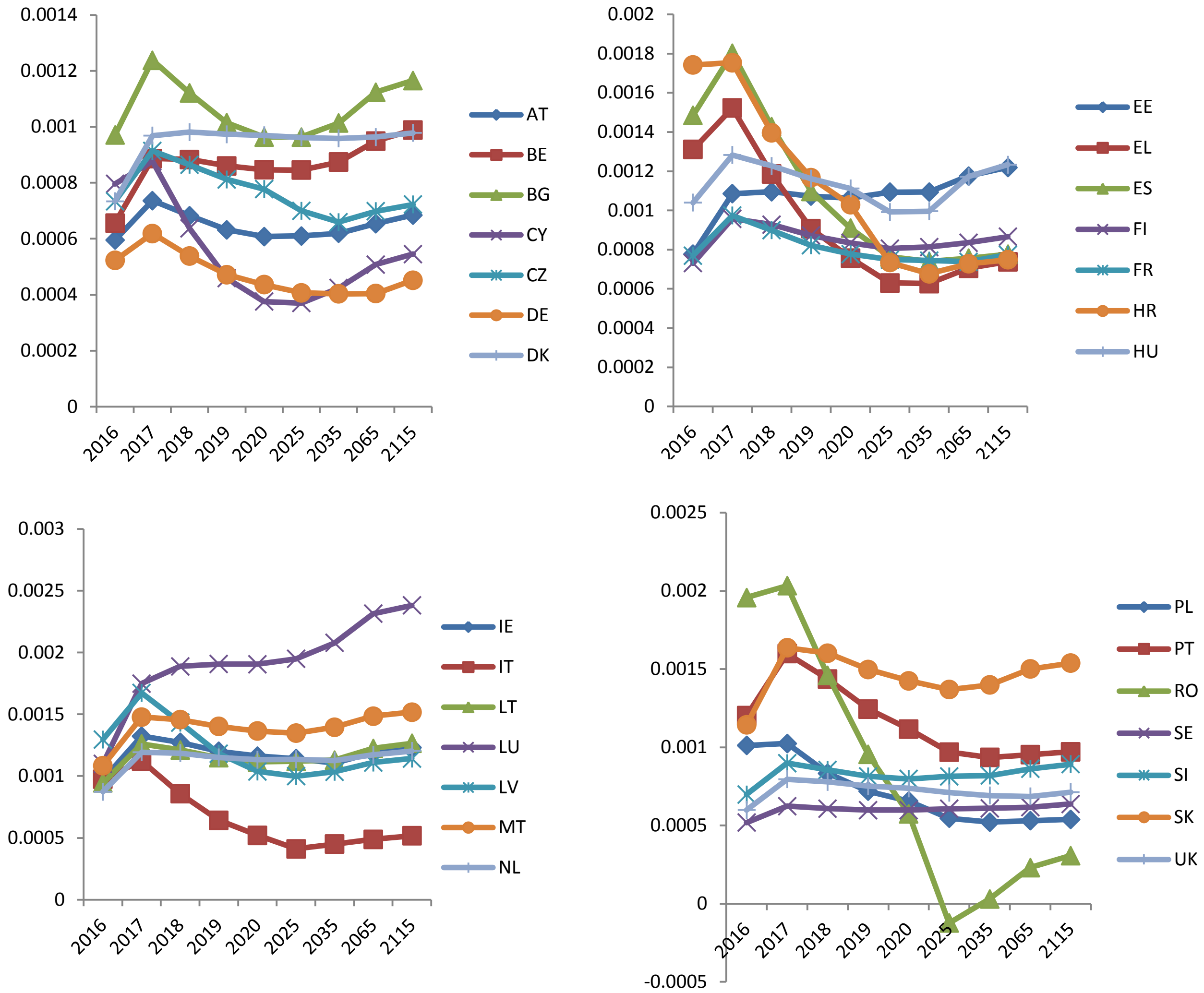
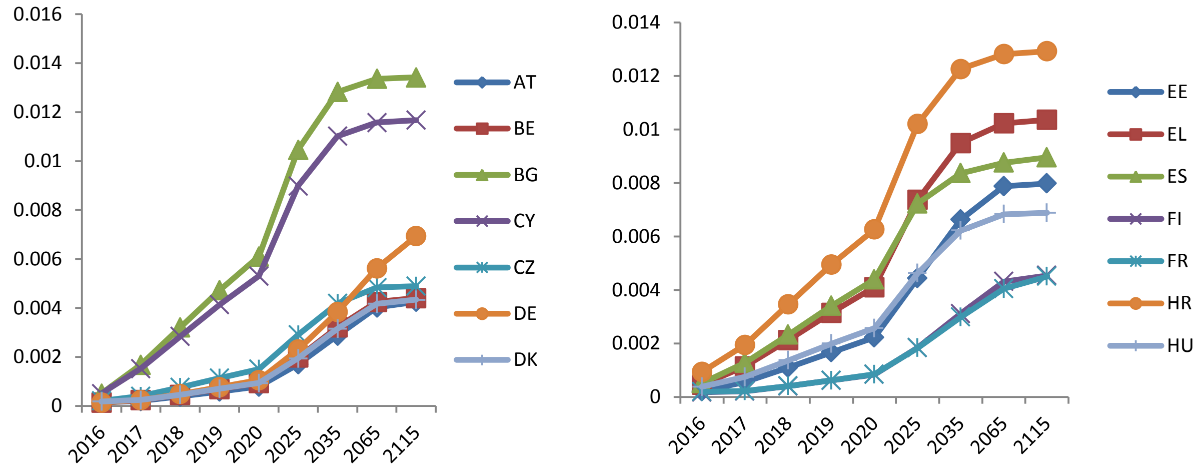
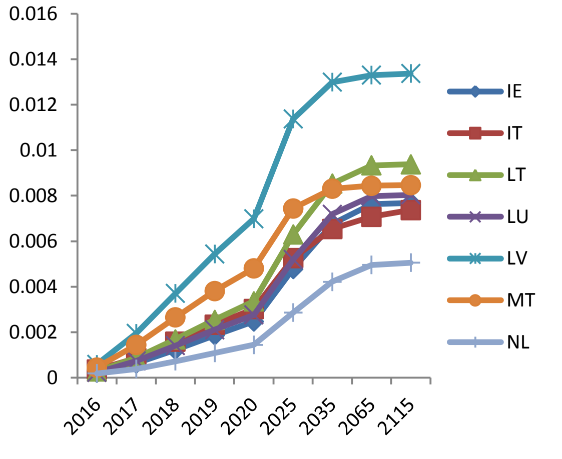
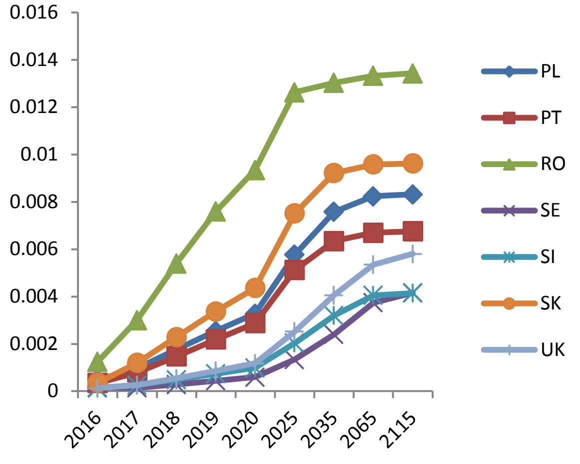


Figure 5. Response of TFP to a reduction in fixed costs equal to 0.1% of GDP







The IRFs above display trajectories that are consistent with the previously discussed mechanics of the model and show some cross-country differences. In all Member States, upon impact, employment and TFP react positively and then progressively converge to permanently higher levels, due to the reallocation of resources towards the R&D sector, which fosters higher growth in the transition back to the steady state. GDP does not necessarily increase upon impact for the reasons mentioned above, but follows the same progressive upward-sloped path.

From Table 1 we can observe that Poland, Malta and Italy exhibit the highest entry barriers among all countries, while also characterized by very low R&D intensity and initial low quantity of researchers. The high marginal return on intangible capital and researchers' productivity result in a lower short term reduction in GDP and in a long term trajectory characterised by a higher slope compared to, for example, Slovenia and Portugal. As another example, the efficiency level of the Italian R&D production function, coupled with a relatively high value of the share of researchers in total labour, constitutes an advantage, as comparatively fewer researchers are needed to increase the production of knowledge, thereby relaxing the pressure on wages and sustaining a higher level of employment also in the long run. Nevertheless, due to comparatively higher wages in Italy, the Italian TFP reacts less than the Maltese and the Polish leading to a slightly higher GDP response for Poland and Malta in the very long-run.

Denmark is characterised by the lowest level of fixed costs and the highest share of initial research labour and R&D intensity in the sample. Given this leadership position, a shock to fixed costs has only a marginal impact on GDP, which exhibits an increase of 0.003% after 20 years from the initial shock. Total employment reacts positively upon impact, mainly due to an increase in the share of employed low and medium skilled-workers. The long-term effect on employment is negligible, increasing around 0.001% with respect to the baseline scenario. The initial high share of R&D employment mitigates the negative impact on GDP resulting from the reallocation of high-skilled labour from the final good sector to the R&D sector. This also implies a comparatively moderate impact on TFP.

GDP and employment in Slovenia, Finland, Belgium, France and the Netherlands react only marginally to a shock on entry costs. Similar trajectories are displayed also by Czech Republic, despite its higher entry costs. In this case, the reaction to the shock is hampered by a comparatively higher risk premium on investment in intangibles.

Portugal and Ireland, characterized by both fairly low entry costs and fairly low shares of research labour, react strongly upon impact, displaying negative deviations of GDP from baseline in the short run. However, their long run GDP trajectory is steeper than the Danish one, while TFP and employment react similarly. The effect of the positive long-run productivity effect of a reallocation of high-skilled labour towards the research sector, which causes the initial drop in GDP, is hindered by a relatively high risk premium. This slows down TFP growth, but sustains GDP, at least in the short-run, as the final sector still benefits from a relatively higher number of skilled-workers whose recruitment in the R&D sector is partially blocked by high risk premia.

Slovakia and Lithuania have relatively low entry barriers and very low R&D intensity and labour dedicated to research. On the other hand, they have a relatively high elasticity of R&D with respect to research labour and also display a relatively strong efficiency of the R&D production function. Consequently, the transmission of the shock is amplified and exhibits trajectories similar to Malta and Poland, which start with much higher entry costs. The same reasoning holds for Spain, whose economy is characterized by fairly high entry costs, a fairly low share of researchers and R&D intensity, but an overall efficient R&D technology.

Germany has a robust R&D sector with a high initial R&D intensity and share of research labour. This is reflected in the calibration of the production function of R&D (i.e. high λ and ν). A reduction in fixed costs, which are higher than the ones prevailing in Denmark, results in a positive long term impact on GDP, TFP and employment. This is particularly strong after 20 years from the initial shock when the trajectories of TFP and GDP becomes the steepest among all countries, owing to the more important role played by structural factors (such as the production technology) in the long-term.

Romania is a particular case, with the lowest R&D intensity and share of research labour employed in the R&D sector together with fairly low initial entry costs. A reduction in entry barriers boosts entry of intermediate good firms and the demand for new designs. The high marginal returns of research labour, combined with a calibration of the R&D production function that indicates an efficient use of the inputs used in R&D production, draws many skilled workers from the final good sector to the research sector. However, GDP reacts positively already in the short run as the strong short-run increase in TFP offsets the reallocation effect. As TFP increases, more low and medium-skilled workers are hired in the final good sector, and total employment reacts comparatively more than in other countries. Over time, upward pressure on wages substantially erodes the initial gains in employment. This process renders the variation of employment in Romania in the very long-run still higher than in the baseline scenario, albeit it reaches the lowest deviation with respect to baseline among all countries analysed.

3.1.3 Policy scenario II: lower entry costs and risk premia

The second policy scenario simulated in QUEST III combines a reduction in fixed entry costs for intermediate firms equivalent to 0.1% of GDP (scenario I), with reduction in the risk premium for intangibles that is proportional to the degree of dispersion of its value across the sample of countries.[23] [24] As before, the shocks are applied to each Member State individually, while the other Member States and the rest of the world stay the same. The following graphs (Figure 6-8) show the impulse response functions of GDP, employment and TFP for the 28 countries.

Figure 6. Response of GDP to a reduction of fixed costs in the intermediate goods sector equal to 0.1% of GDP and a reduction in the risk premium for intangibles proportional to the degree of the sample's dispersion.

[23] Intangibles are purchased by intermediate firms and hence a reduction of the risk premium can be interpreted as easier access to finance for start-ups.

[24] In particular, the reduction applied equals the percentage of the maximum value for the risk premium that the difference between the maximum and minimum values in the sample represents. This yields a reduction of about 1% of the initial level of the risk premia in each country.

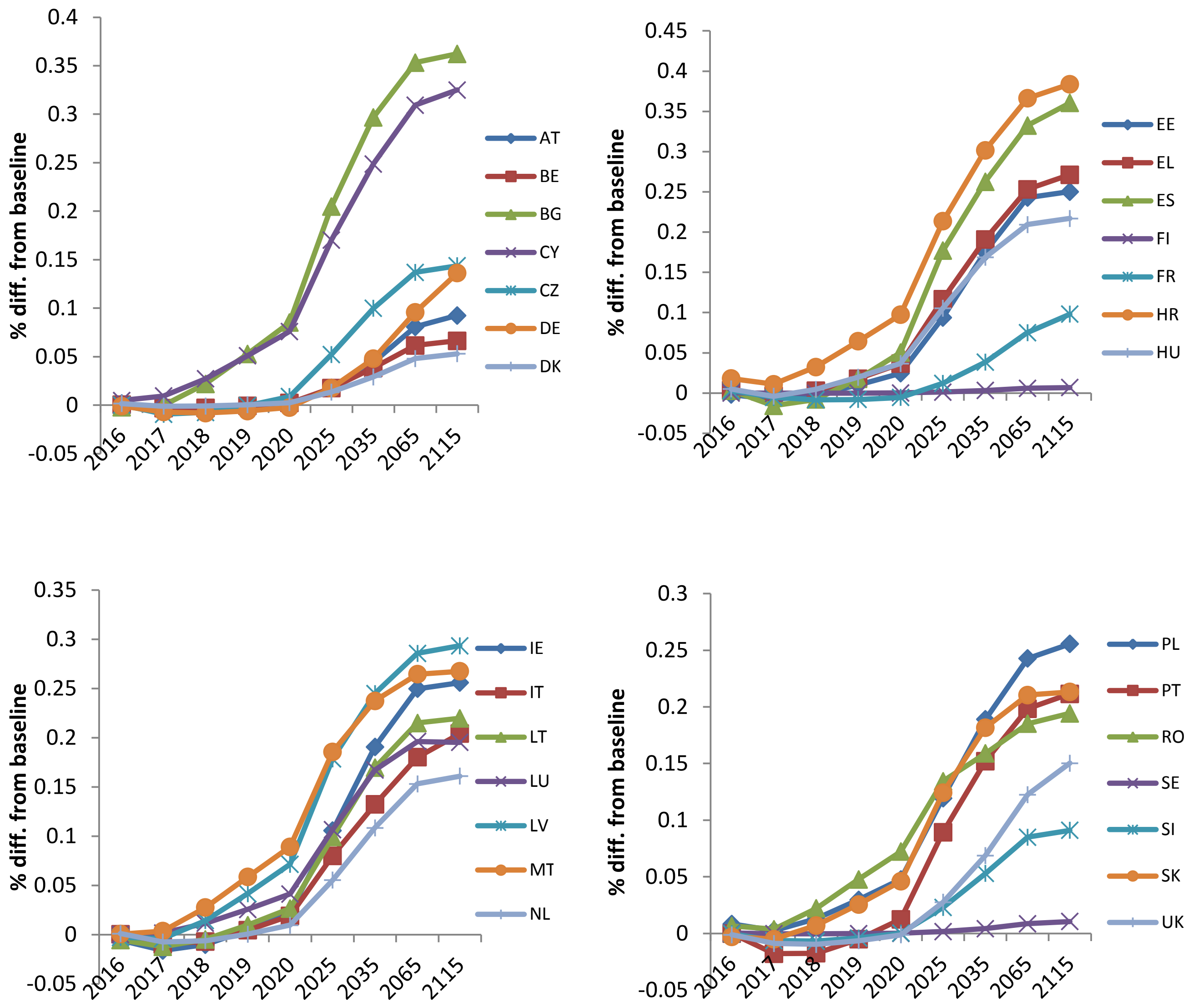


Figure 7. Response of aggregate employment to reduction in fixed costs in the intermediate goods sector equal to 0.1% of GDP and a reduction in the risk premium for intangibles proportional to the degree of the sample's dispersion.

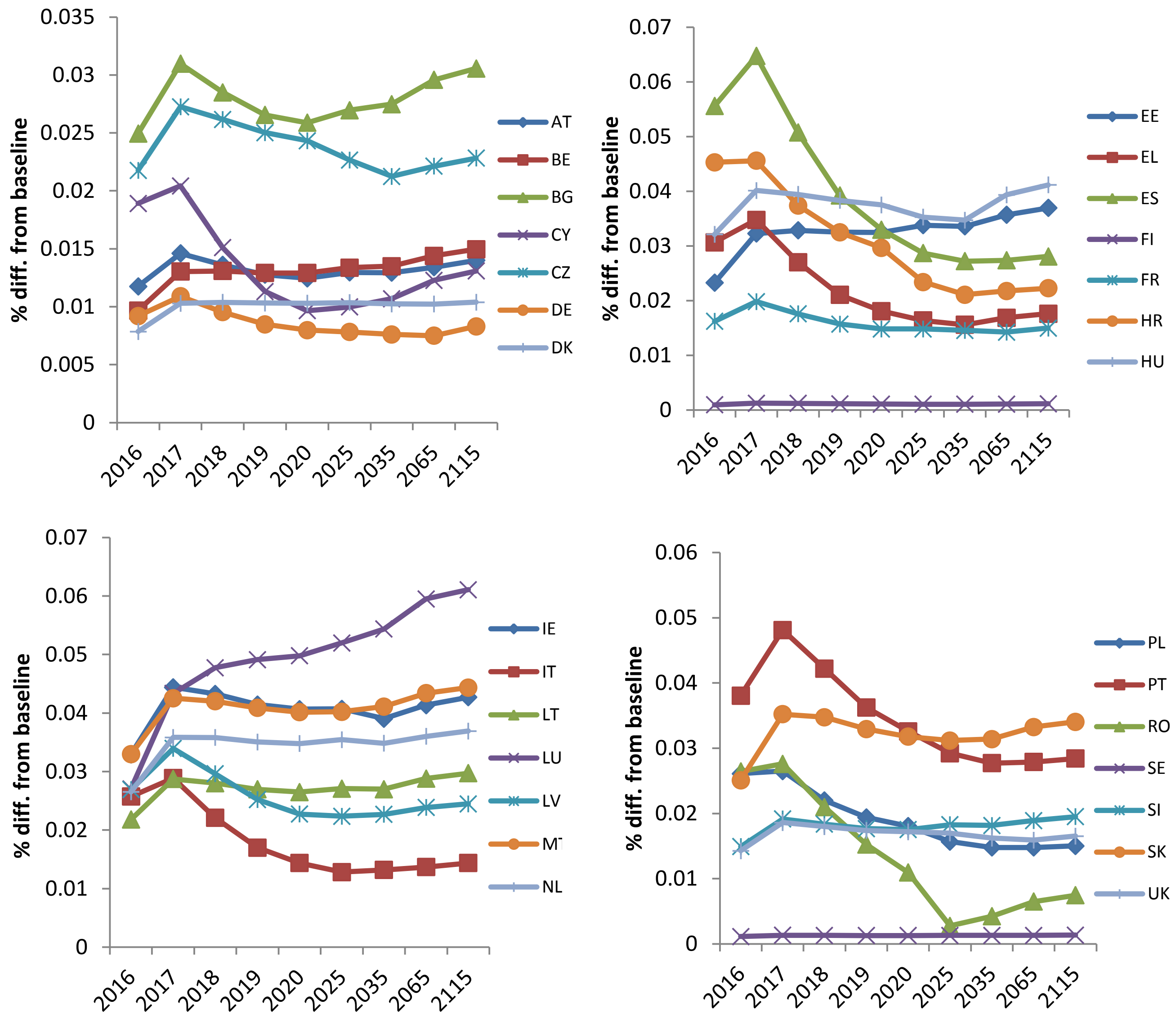
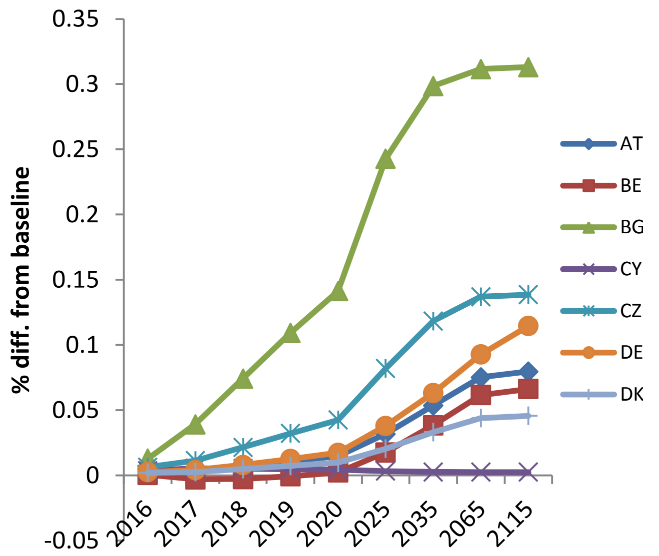
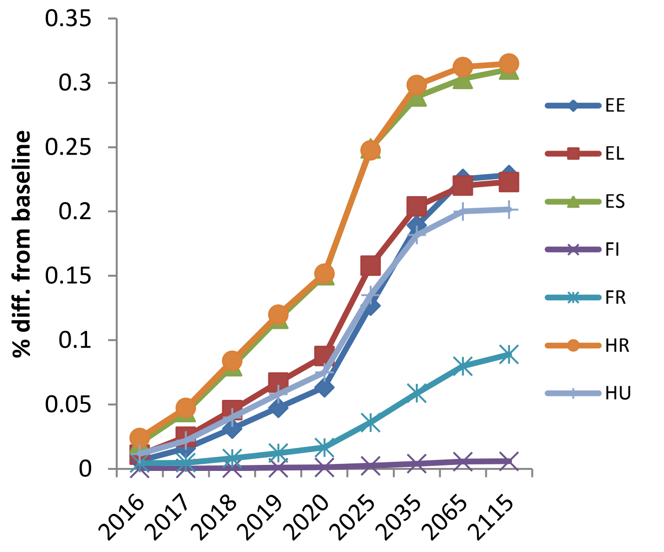
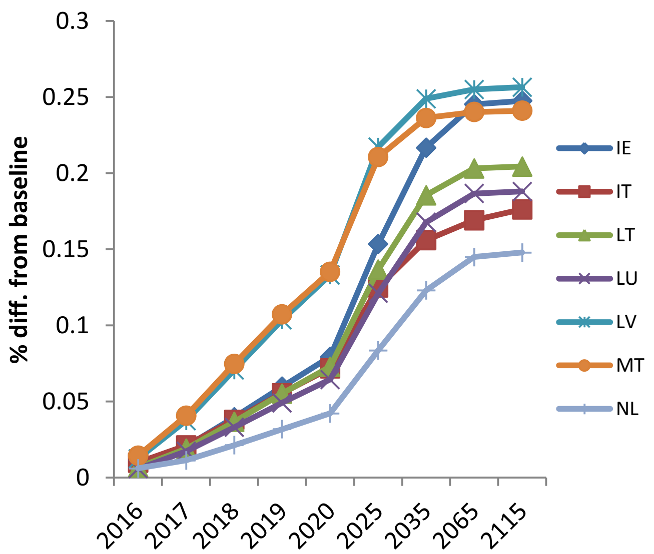
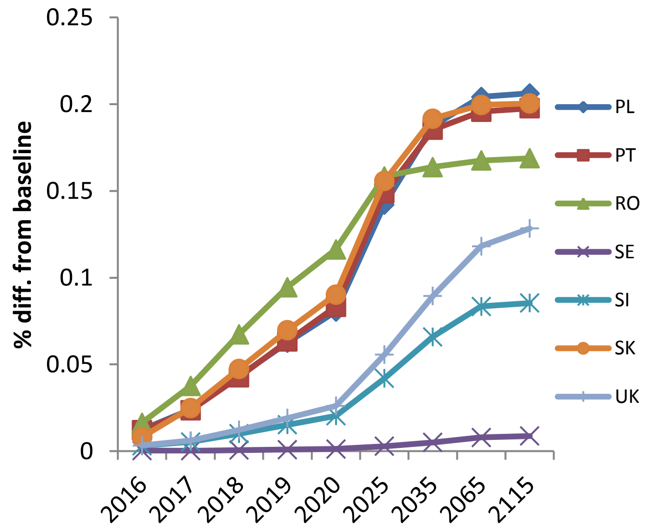


Figure 8. Response of TFP to a 0.1% reduction in fixed costs in the intermediate goods sector equal to 1% of GDP and a reduction in the risk premium for intangibles proportional to the degree of the sample's dispersion.









Given the similar nature of the two shocks, in terms of the components of the model affected by them, the impact of the combined shock can be interpreted as an amplification of the shock to fixed costs only. As discussed before, this leads not only to considerable gains in the long term for all Member States but also to asymmetries in the distribution of those gains across countries and over time. Table 2 reports the differences in GDP gains between the second policy scenario and the first policy scenario, which features only a reduction of entry costs. In each year, the three countries that gain the least from adding a shock on the risk premium are highlighted in red, while the three countries that gain the most are highlighted in bold.

A number of observations follow from inspection of Table 2. First, as expected, in the long run all Member States experience higher economic returns to the joint shock compared to the mere reduction of fixed costs. This holds because both a reduction in fixed entry costs and risk premia incentivise R&D investment and hence economic growth ultimately. Second, in the short run, however, the effect of the joint shock on GDP is lower than the effect of only reducing entry costs in certain Member States, including Ireland, Lithuania, Portugal and Slovakia. This short-run behaviour points to the existence of greater incentives in these countries to forego final good production in favour of increased R&D employment and hence R&D production, owing to a combination of factors, including relatively low high-skilled employment levels in the R&D sector. Third, Bulgaria, Croatia, Cyprus, Malta and Poland are among the countries that exhibit the highest comparative gains under the second scenario, on the back of higher risk premia and a less developed R&D sector. Fourth, Spain is the only Member State that experiences lower impacts on income in the short run, but ranks among the top three of highest impacts in the long run in the combined shock scenario. The factors behind this dissimilar behaviour in the short vis-a-vis the long-run horizon coincide with the ones underlined in section 3.1.1 (namely, fairly high entry costs, a relatively low share of researchers and R&D intensity, and an overall efficient R&D technology), with the addition of a relatively high starting level of the risk premium (9th highest). Spain thus exemplifies the (optimal) process of increasing investment in innovation in the short-to-medium term, which comes at the expense of foregoing economic growth in those periods, but in exchange for higher GDP levels relative to other countries in the long run.

Table 2. Percentage point differences in GDP impacts between policy scenario II and policy scenario I at different time horizons

	2016	2017	2018	2019	2020	2025	2035	2065	2115
AT	0.001691	-0.00282	-0.00343	-0.00189	0.000827	0.017022	0.041899	0.076586	0.087679
BE	0.000421	-0.00271	-0.00252	-0.00057	0.002187	0.016441	0.035838	0.057369	0.06174
BG	-0.00191	-0.00021	0.021018	**0.050496**	**0.081445**	**0.196**	**0.283988**	**0.338048**	**0.346714**
CY	0.004674	**0.009106**	**0.025936**	0.048512	0.072352	**0.162454**	0.237228	0.295076	0.309996
CZ	0.000352	-0.00897	-0.00726	-0.00036	0.008622	0.050535	0.096411	0.132226	0.138685
DE	-0.00079	-0.0066	-0.00753	-0.00561	-0.00228	0.016657	0.045072	0.090041	0.127986
DK	0.001507	-0.00095	-0.00082	0.00047	0.002315	0.012224	0.026448	0.043487	0.048051
EE	-0.00171	-0.0078	-0.00207	0.009591	0.023779	0.090545	0.169142	0.234395	0.241569
EL	0.003791	-0.00311	0.002837	0.017002	0.034697	0.111187	0.181962	0.241315	0.258566
ES	0.003136	-0.01538	-0.00779	0.01709	0.048743	0.171811	**0.254928**	**0.322792**	**0.349929**
FI	5.19E-05	-2.8E-05	-4.3E-05	-2.3E-05	1.9E-05	0.000296	0.000732	0.001342	0.001552
FR	0.003044	-0.00492	-0.00801	-0.00763	-0.00528	0.011499	0.036431	0.071286	0.093077
HR	**0.017427**	**0.010536**	**0.031118**	**0.061738**	**0.093339**	**0.204677**	**0.289316**	**0.351308**	**0.368111**
HU	0.00486	-0.0038	0.004345	0.019097	0.035556	0.10201	0.162948	0.202272	0.209588
IE	-0.0054	-0.01558	-0.00982	0.00449	0.022274	0.10244	0.184761	0.242026	0.247993
IT	0.000607	-0.00935	-0.00655	0.004278	0.018271	0.076763	0.12686	0.172735	0.195712
LT	-0.00512	-0.0117	-0.00459	0.009208	0.025322	0.094742	0.161814	0.205183	0.209663
LU	0.00031	0.001606	0.011145	0.024703	0.039603	0.102208	0.160169	0.187988	0.18708
LV	-0.00249	-0.00374	0.013447	0.039458	0.067723	0.16921	0.23214	0.270877	0.278135
MT	0.000689	0.003413	**0.026618**	**0.05651**	**0.086014**	0.179107	0.229133	0.25521	0.258175
NL	0.001123	-0.00721	-0.0059	0.00052	0.009364	0.053474	0.104809	0.147959	0.155604

PL	**0.008032**	0.00252	0.01248	0.02847	0.045729	0.114646	0.181329	0.232934	0.245308
PT	-6.4E-05	-0.01728	-0.01693	-0.00503	0.01188	0.086109	0.146803	0.191566	0.204176
RO	**0.006417**	**0.003792**	0.02228	0.047767	0.072163	0.13363	0.156927	0.181096	0.189328
SE	-2E-05	-0.00047	-0.00205	-0.00396	-0.00567	-0.00898	-0.00827	-0.006	-0.00477
SI	-0.0002	-0.00603	-0.00645	-0.00385	0.000211	0.02179	0.05042	0.080854	0.086653
SK	-0.00283	-0.00477	0.006674	0.024331	0.043736	0.118158	0.172886	0.200421	0.202951
UK	-0.00112	-0.00839	-0.00918	-0.00615	-0.00122	0.026289	0.065711	0.117035	0.143501

4 Concluding Remarks

After the launch of the Lisbon Strategy in 2000 and subsequent actions such as the Entrepreneurship 2020 Action Plan, several Member States have introduced measures to support entrepreneurship, the creation of new firms and the improvement of productivity among existing firms, including addressing the barriers that firms face for entering new markets. This paper has: (i) framed these policy interventions in a macroeconomic context, briefly reviewing the definition of entry barriers, and the macroeconomic models and mechanisms through which entry barriers affect GDP, productivity, and employment; (ii) quantified the impact of a reduction of entry barriers in the 28 Member States using the European Commission's QUEST III model.

The simulations obtained with QUEST III show that policies aimed at reducing entry barriers should be understood and conceived as long-term policies. The positive impact on GDP, employment, and productivity becomes sizeable only in the medium to long run. Moreover, in the light of the model's results, a mix of policy interventions combining a reduction of administrative costs with improved access to finance achieves greater benefits for all Member States compared to implementing them individually. Long run effects seem stronger in Member States with comparatively less developed R&D and innovation systems and financial sectors. This points to the need for increased efforts to facilitate investment in innovation in these countries in order to maximise the impacts of such long-term policies.

An important caveat is that public policy cannot reduce all types of entry barriers, as many barriers are a result of inherent product features and competitive behaviour of firms as well as countries' past legislations and institutional framework. However, policy makers can target regulations including the application of competition laws, thereby mitigating entry barriers. In some cases of heavily regulated markets, such as network industries, public policy can also play a crucial role in opening up markets, but in other cases, the role of public policy in reducing entry barriers may be quite limited. Therefore, the overall macroeconomic impact of actionable policies depends on the industrial structure of a particular economy. Understanding how sectoral specificities and related policies can affect the macroeconomic outcomes of a country is a potential venue for further research.

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