Government Size, Institutions, and Export Performance among OECD Economies

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Abstract

With a panel of 18 OECD countries, 1980-2005, we investigate the determinants of export performance, in particular the effects of the size of government and institutional features. In a model of endogenous extent of domestically-produced goods, government size has a non-linear effect on export performance; the export-maximising size of government (tax receipts) is around 40-45% of GDP; the best size of productive government spending is around 16% of GDP. Product market and labour market-related rigidities affect negatively the export performance both on their own and via a negative effect on the effectiveness of R&D and slow down the speed of adjustment. Among traditional variables, relative unit labour cost, R&D shares in GDP, TFP growth and human capital show up significantly and with the expected signs.

Keywords: Export shares, government size, institutions, unit labour cost, competitiveness

JEL Classification Numbers: E020, F14, F41

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1. Introduction

A country's export performance is of great concern to both academic economists and policy-makers for a number of inter-related reasons: Exports are a source of demand with beneficial effects on GDP and employment; they help improve the trade balance and alleviate external deficits; the export sectors may be among the most dynamic in an economic, providing an impetus for innovation and technological advancement. At a time when stagnation seems to be setting over large sections of the world economy, there is renewed focus on exports as a strategy for economic revival. As a result, the interest in the determinants of a country's export performance is ongoing. This paper's broad aim is to contribute to these debates. Our departure point is the landmark paper by Carlin, Glyn and Van Reenen (2001), which investigates factors affecting the relative exports among 14 OECD countries. They conclude that while well-known variables such relative unit labour costs and indices of technological advancement are important, they cannot by themselves explain entirely the developments in export shares. Among the factors that are suggested as missing include 'deep structural characteristics' of these economies. This paper's aim is to investigate the role of two sets of such deep characteristics in shaping export performance, namely the size of the government sector, and labour and product market 'institutions'. The findings should be of direct policy relevance, as well as constituting contributions to the literature.

More specifically, the paper accomplishes a number of objectives. Firstly, it investigates the empirical relevance of traditionally highlighted factors, such as the following: Unit labour costs, as they are widely found to be significant determinants in empirical export regressions (Fagerberg, 1988; Carlin *et al.*, 2001; Leon-Ledesma, 2005; Cavallaro and Mulino, 2009); the extent of research and development (R&D), as this underlies the product differentiation emphasised by new trade theory as a key export driver (see Helpman and Krugman, 1985; empirical validation of these models can be found in Hummels and Levinsohn, 1993; Leon-Ledesma, 2005; Cavallaro and Mulino, 2009; Athanasoglou and Bardaka, 2010). A second objective is to include 'institutions' among the determinants of export performance, particularly labour market and product market institutions, and the regulatory environment. The role of the former in affecting unemployment has been widely investigated and debated (see Nickell, 1990, 1997; Blanchard and Wolfers, 2000); product market competition has been argued to affect wages and unemployment (Griffith, Harrison and Macartney, 2007); entry regulation for new firms is seen as detrimental to firm entry and growth (Djankov, La Porta, Lopez-DeSilanes and Shleifer, 2002; Koeniger and Prat, 2007). Knack and Keefer (1995), Acemoglu, Johnson, and Robinson (2001), Paldam and Gundlach (2008) and Drine (2012) (among others) show that the quality of institutions matters for growth and development; and Gwartney, Holcombe and Lawson (2006) show that it also matters for the level and productivity of investment. These institutional features and rigidities may also impact on export performance; this should be

expected from the findings of Nicoletti and Scarpetta (2003), for instance, that a high degree of rigidity in the labour market raises the cost of production substantially, preventing resources from moving quickly and costlessly towards more productive activities. To preamble, we find that many, though not all, of these institutional variables are important determinants of export performance; we are thus able to go forward in the direction suggested by Carlin *et al.* (2001) and to provide information of help in the design of sound institutions.

A further contribution of this paper is to investigate the role of government size in promoting exports. The role of government in economic development continues to be debated. Critics argue that government crowds out utility-enhancing private consumption by wasteful public consumption (Mitchell, 2005); moreover, redistributive taxation may breed corruption, dependence or moral hazard (Sinn, 1995). Proponents of government spending and the welfare state (Atkinson, 1995a, 1995b) question the specifics of many of these arguments and view the international evidence on the government spending-growth relation as mixed. The empirical link between government size and economic performance is mixed (La Porta *et al.*, 1999; Temple, 1999). Theoretical approaches emphasise the beneficial effects of productive public services such as maintenance of the rule of law, investment in infrastructure, promotion of human capital via education and health, and delineation of property rights and contract enforcement (Aschauer, 1989; Fisher and Turnovsky, 1995; Turnovsky, 2000; Tsoukis and Miller, 2003; Ghosh and Roy, 2004); Irmen and Kuehnel (2009) provide a survey of this literature. Barro (1990) analyses both aspects of public services, the productivity-enhancing one and the disincentives induced by higher taxation; the growth-government size relation may be summarised by a hump-shaped curve. There is thus a conceptually clear optimal size of government.[1] Empirically, public investment on infrastructure has a beneficial effect on growth (Easterly and Rebelo, 1993; Demetriadis and Mamuneas, 2000; Canning and Pedroni, 2008). We continue this debate by investigating the contribution of government size to relative exports, another measure of macroeconomic performance. To preamble, both theoretically and empirically, we consistently and robustly find a hump-shaped curve of export performance versus government size along the lines of Barro (1990). There is a clear policy relevance of this finding: There is a government size that is best from the point of view of maximising exports; we discuss this government size suggested by our estimated regression coefficients.[2]

[1] Karras (1996) provides one of few attempts to empirically implement this idea and determine whether public services are optimally provided or not. Alesina (1999) argues that countries with low incomes tend to have inefficient, insufficient and corrupt government, while at high incomes, government is too much and generates some kind of addiction from public services. This view parallels the reasoning of Barro (1990) but reverses the order of causality (in Barro, causality goes from public services to growth, in Alesina it is the opposite).

[2] This does not mean that governments do, or even should, care about export performance. Our point is that, *if* governments do care, they ought to aim for the government size that we show as maximising the export share.

Our investigation is related to a number of strands in the literature. Alesina and Perotti (1997) studies theoretically and empirically the effects on competitiveness of redistribution financed by distortionary taxation. Their empirical part confirms the theoretical predictions: For instance, a rise in labour tax by 1% of GDP increases unit labour costs by as much as 3%. Our line of investigation has a different focus from this paper, namely we enquire about the determinants of export performance; competitiveness is an explanatory, rather than a dependent, variable. Moreover, we use a more recent and extensive panel data set than the one applied in Carlin *et al.* (2001). Elsewhere, the possibly bi-directional links between institutions and trade openness have been investigated by Dollar and Kraay (2003), Giavazzi and Tabellini (2005), and Meon and Sekkat (2008). Institutions and their quality have also been linked to the pattern of trade. Levchenko (2007) and Nunn (2007) have shown that differences across countries in institutions such as the quality of contract enforcement and property rights are an important determinant of trade flows. Our paper is also related to a strand of literature that investigates the causality between trade openness and government size, with mixed conclusions: Among others, Epifani and Gancia (2009) show that higher openness leads to bigger government, while Benarroch and Pandey (2008) reaches exactly the opposite conclusion (greater government leads to lower openness). Despite their relevance, our paper seeks to address different questions: In particular, export performance (as measured by relative export shares) is linked to the pattern of trade and openness but also encompasses questions of price and non-price competitiveness. From a different perspective our analysis is also linked to the trade imbalances literature; see Hal *et al*., (2010) and Belke *et al*., (2015).

To gain intuition, we firstly build a theoretical model, reviewed in Section 2: We analyse relative export performance in a setup that draws on the vintage model of Dornbusch, Fischer and Samuelson (1977). This model determines market structure (share of a unit-mass of goods produced by each of two countries) based on unit labour costs in a monopolistically competitive product market. In this basic setup the role of the state sector and institutions in promoting export performance are investigated. In the empirical Section 3, we investigate the relation between export performance, labour and product market institutions, and the size of government as measured by the total tax revenue-GDP ratio using a panel of 18 OECD countries, 1980-2005. The 'institutions' refer to labour (employment protection legislation) and product (barriers to entrepreneurship, competition, and FDI; and overall product market regulation) markets. The product market-related institutional features considered in the study impact negatively on international export shares via lowering the effectiveness of R&D; nonetheless we could not uncover any significant role for labour market-related rigidities. Among more traditional determinants of export performance, relative unit labour costs and R&D turn up as expected, while purely social (i.e., non-productive) expenditures harm international competiveness, in a way consistent with Alesina and Perotti (1997). Section 4 carries out further

robustness and sensitivity tests, while Section 5 concludes. An online Appendix outlines in greater detail the theoretical model of the paper.

2. A Model of Government Size and Export Performance

The theoretical model seeks to uncover the channels of influence of the size of the state sector on export performance. While the tax rate reduces competitiveness (Alesina and Perotti, 1997), it may also increase productivity via its support of productive public services (Barro, 1990). To bring these arguments to bear on export performance, we adapt the dynamic Ricardian model of Dornbusch, Fischer and Samuelson (henceforth DFS, 1977; see also Obstfeld and Rogoff, 1996, Chapter 4) coupled with monopolistic competition in the product and labour markets (something missing from the original model). We also combine this with productive public services in the manner of Barro (1990). In contrast to the supply-side model of Barro (1990), here demand is determined first, and then labour demand is determined residually. The production function is characterised by a constant elasticity of substitution. There is also the possibility of unemployment in the labour market, and hence a meaningful role for trade unionism. This links up with a rich literature on the effects of union behaviour (see Nickell, 1990, for a survey). These are valuable extensions of DFS (1977) in their own right and never so far incorporated into the same model. The main focus here is to highlight the effects of state size and institutions on competitiveness and ultimately export performance.

There is a continuum of goods, $i \in [0,1]$ that are internationally tradable. A fraction, $0 < z < 1$ of them is produced by the Home economy (*H*), and the rest by the Foreign economy (*F* - the latter will be indicated by starred variables). We indicate by α_i and α_i^* the unit labour requirements (inverse productivity) for each good *i* in each of the two countries. Thus, the ratio $A(i) \equiv \alpha_i / \alpha_i^*$ indicates the relative productivity of *H* concerning good *i*. Later on, we shall consider also broader interpretations of productivity and $A(i)$ that bear on institutions. We index the goods such that $A'(i) < 0$; thus, *H* has a relative productivity advantage for goods with a low *i* and *F* in those with a high *i*.

Due to the monopolistic structure of the goods market, producers in all sectors enjoy a monopolistic markup of price over marginal cost ($\mu > 0$); so, the generic producer *j* sets their price according to:

$$P_i = \frac{(1+\mu)\alpha_i W}{B} \tag{1}$$

W is the nominal wage producer *i* faces, common across the domestic economy; it is determined by institutional characteristics of the labour market. Where *B* is productivity; it will be defined more

precisely below. The markup μ is exogenous, reflecting institutional/regulatory structure, and differs across the two economies. Allowing for a different mark-up and nominal wage, symmetry applies to pricing in the foreign market. All goods for which $P_i < (>) P_i^*$ will be produced by the Home (Foreign) economy. In view of the pricing rule, therefore, good *i* will be produced by *H* if:

$$\frac{(1+\mu)\alpha_i W}{B} < \frac{(1+\mu^*)\alpha_i^* W^*}{B^*}$$

The marginal good *z* by definition equalises costs across the two economies:

$$\frac{(1+\mu)\alpha_z W}{B} = \frac{(1+\mu^*)\alpha_z^* W^*}{B^*} \tag{2}$$

Any good $i < z$ will be produced by *H* and $j > z$ will be produced by *F*. We may therefore interpret *z* $(0 < z < 1)$ as the (endogenous) extent of 'market capture' by the Home economy.

Given our definition of relative productivity, $A(i) \equiv \alpha_i / \alpha_i^*$, $A'(i) < 0$, and the condition for the marginal good, *z*, (2), we have:

$$A_z = \frac{\left[(1+\mu)W\right]/B}{\left[(1+\mu^*)W^*\right]/B^*} \tag{3}$$

Since *A* is an inverse function of *i*, the extent of *H* production (*z*) rises with the foreign product markup and nominal wage and falls with the domestic ones. The exogenously given curvature of the *A*(*i*) function also plays a role: Apart from reflecting productivity in a narrow sense, this may also be interpreted as a country's institutional features that have a bearing on productivity, as alluded to above. A rise in relative productivity by the domestic economy, indicated by a shift in $1/A(i)$ such that the new distribution is first-order stochastically dominated by the old, implies that the domestic economy is more productive across the board. This may be interpreted as a technological improvement but it may also be a business-friendly institutional change: The extent of *H* production (*z*) rises.

Individual good production is characterised by the simple technology:

$$Y_i = \frac{BL_i}{\alpha_i} \tag{4}$$

As in Barro (1990), productivity (B) is underpinned by public services. Public services are supported by levying a flat tax at rate (τ) across all incomes; a balanced budget is assumed, so this rate also

equals the public services-GDP ratio. Public services are assumed non-rival and not subject to congestion. Accordingly, productivity is specified as:

$$B = (\tau Y)^{\beta} \tag{5}$$

In order to provide services, the government is assumed to buy all goods (worldwide) in the same proportion as individual consumers. The parameter $0 < \beta < 1$ captures the production effectiveness of a given level of public services, and may therefore be interpreted as a measure of institutionally-determined efficiency in the model. In view of our specification for productive public services (5), (3) becomes:

$$A_z = \frac{\left[(1+\mu)W\right]/(\tau Y)^{\beta}}{\left[(1+\mu^*)W^*\right]/B^*} \tag{6}$$

Totally-differentiating, we find that the tax rate will affect the degree of H production (z) as follows:

$$\frac{\partial z}{\partial \tau} = \frac{\frac{\gamma(1-\phi)}{1-\tau} - \frac{\beta}{\tau}}{A'(z)} \tag{7}$$

where γ>0 is the strength of the union and ϕ>0 is its degree of centralisation. (More details of the model are given in the online Appendix.)

The first term in the numerator, $\frac{\gamma(1-\phi)}{1-\tau}$, captures the effect of the tax on the bargained real wage between the firm and the union (see Proposition 1 below for parameter definitions) and $A'(.) \equiv \frac{\partial A(i)}{\partial i} < 0$. Therefore, we have the following sign:

$$sgn\left\{\frac{\partial z}{\partial \tau}\right\} = -sgn\{\tau - \overline{\tau}\},\ \ \overline{\tau} \equiv \frac{\beta}{\beta + \gamma(1-\phi)} \tag{8}$$

(8) defines a threshold tax rate, $\overline{\tau}$ around which the balance of effects of the tax rate on the degree of specialisation changes sign: The two effects are a positive one via public services and a negative one via the effect on the union-bargained wage. We thus get a hump-shaped graph of $z(\tau)$, which parallels the graph of growth on the tax rate in Barro (1990), but does not seem to have been derived in the export literature. We therefore get an optimal tax rate, and government size (because of the balanced budget), from the point of view of maximising *z*, the extent of Home production and its 'capture' of world markets. A rise in the level of productivity, technical or institutional, as captured by

$A(i)$, raises $\left|\frac{\partial z}{\partial \tau}\right|$ by reducing $\left|A'(.)\right|$ for all i. Though this will increase z, it will not change the optimal tax rate $\overline{\tau}$. These results are summarised in the following proposition:

Proposition 1: On the determinants of Home production (z):

a) *The tax rate exerts a dual effect on the degree of market capture by H (z): positively, via the productivity-enhancing public services, and negatively via the effect on the bargained real wage derived from union behaviour. The balance of the two effects gives the tax threshold,* $\overline{\tau}$ *,this is the optimal government size with respect to the maximisation of the share by H of world production (z).*
b) *The strength of the union (greater* γ*) exacerbates the negative effect of the tax on the wage, as the union is better able to compensate for the loss of net pay in negotiations, and therefore reduces the threshold tax rate,* $\overline{\tau}$ *.*
c) *A more centralised union (higher* ϕ*) mitigates the negative effects in (b), as the union internalises the negative externalities caused by its actions; hence it increases the threshold tax rate* $\overline{\tau}$ *.*
d) *Institutionally-determined efficiency (*β*) increases z and the threshold tax rate.*
e) *Ceteris paribus, a greater degree of technological or institutional productivity, manifested in the productivity term* $A'(z)$*, increases the effect that the tax rate has on the extent of Home production, z.*

Proof: All parts of the proposition readily follow from (A.20) in online Appendix A.

Additional results can be obtained with further analysis of the model, not shown here for economy of space. In particular, we get the following on export performance (taken as the share of H in world exports, one of the measures that will be used in Section 3):

Proposition 2: Determinants of relative export performance:

a) *For a sufficiently low tax rate (below the threshold specified in (b) below), relative export performance falls with trade union strength (*γ*), rises with trade union internalisation of the effects of its actions (* φ, ϕ *) and rises with productivity (* $A'(z)$ *)).*
b) *Institutionally-determined efficiency (*β*) increases the export ratio at least for a sufficiently low tax rate; but its effect on the threshold tax rate is not clear-cut.*
c) *The threshold tax here is lower than the threshold tax rate that maximises Home production or output. This is because of the effects of taxation on Home and Foreign demand.*

Proof: All parts of the proposition readily follow from (A.27) in online Appendix A. It is also easy to show that the same effects apply when we measure export performance of *H* by this country's exports-GDP ratio.

3. Estimation

Building upon the implications of the theoretical framework of Section 2, this Section estimates the relationship between measures of the state sector, institutions and export performance. We begin by discussing the data, before proceeding to empirical specifications.

3.1 Basic data

Our data sample consists of 18 OECD countries for the period 1980-2005, a more recent and extensive panel than our closely related precursor studies (Alesina and Perotti, 1997; Carlin *et al*., 2001).[3] Our overall strategy is to regress export shares on variables that capture state size and institutions, as well as cost competitiveness. As is standard in the literature (see Amendola *et al*., 1993; Carlin *et al.*, 2001; Montobbio, 2003), export performance is measured as the share of country's exports to total world exports (data from UNCTAD)[4]; we also carry out robustness analysis using the export-GDP ratio. Cost competitiveness is proxied by an index of Relative Unit Labour Costs (RULC). We use data from EU KLEMS Growth and Productivity Accounts, 2009 edition (www.euklems.net), on value added, labour compensation and number of employees to construct Unit Labour Costs relative to our sample means (of 18 OECD countries), following standard practice IN applied trade modelling (see among others, Athanasoglou and Bardaka (2010)).[5] We control for technological complexity and product differentiation of exports using a measure of industry-funded R&D as a percentage of GDP taken from Science and Technology Indicators, OECD (2010 edition).

The government size variables are taken from the OECD. As a first proxy of government size, we use the total tax revenue as a share of GDP; we shall use both the variable itself and its quadratic to uncover any possible Barro (1990)-style hump curve of the type highlighted above. As state expenditures do not only support productivity-enhancing public services but also include transfer payments and other social types of expenditure, which may induce only the disincentive or distortionary effects of taxation without any impact on productivity, any estimated positive effect of government size on exports may be interpreted as understating the true effect, and therefore being a

[3] We rely on different sources for the various data series; merging these data sources results in our sample.
[4] 'Total world exports' is defined here as the sum of exports of the 18 countries in the sample.
[5] Further details for the construction of RULC can be found in Appendix C.

low bound. In order to investigate further the possibility that some government spending is not productive (but does entail taxation), we proceed in a dual way: Firstly, we also include separately the purely social spending alongside total tax receipts; secondly, we disentangle purely social spending from government expenditure using a variable of productive government spending (G^{pr}). A number of other variables will be described as we go along. Online Appendix B summarises the data sources, descriptive statistics, and graphs for competitiveness, export performance, taxation, and R&D.

3.2: Institutional rigidities

The institutional feature (or 'rigidities') that we consider are the empirical counterpart to the parameter β of Section 2, which controls for the effectiveness of the public services in the aggregate production function, and which was found in general to increase the home economy's production, capture of export markets and relative export performance (see Proposition 2). Institutional rigidities are likely to be economy-wide but they affect disproportionally the more dynamic and innovative. As such, such rigidities can impact disproportionately on the effectiveness of R&D, which is crucial in building a knowledge-based economy with a competitive edge in innovation and product quality. Therefore, we have entered these institutional rigidities in the regressions below both on their own and as interaction terms with R&D.[6] Thus, our empirical specification (9 – see the next sub-Section) is augmented by the terms: $\beta_2 Ins_c^h + \beta_3 \left(1+\theta Ins_c^h\right) R\&D_{c,t}$, where Ins^h stands for the h-th institutional index: *h=EPL, Bar.Enter, Bar.Comp, Bar.FDI.*

The first institutional index considered refers to Employment Protection Legislation (EPL), see Cahuc and Postel-Vinay, (2002) for further evidence on this index in the unemployment literature. This index ranges from 0 (a fully liberal labour market without any protection) to 6 (fully protective).[7] It is a standard argument that economies with heavily protected labour markets are less mobile hindering the allocation of resources towards more dynamic and efficient units (Nickell, 1997; Nicoletti and Scarpeta, 2003). Furthermore, recent studies in the literature of applied industrial organisation and growth (Besley and Burgess, 2004; Rodrik, 2005 Arnold *et al.*, 2008) have pointed out that rigid markets increase the cost of adjustment, hurting in particular those industries that have the potential to excel in international markets. The second measure to be considered therefore is 'barriers to entrepreneurship' (*Bar.Enter*), capturing administrative regulation that impacts negatively on economic performance. Such regulation includes the existence of cartel practices, the extent of

[6] These institutional indices are only reported for three years (1988, 2003, and 2008); furthermore they change slowly over time, so that they are almost time invariant. As a result, we entered them only as country means; this means that they could only be entered multiplicatively (i.e., in order to avoid perfect multicollinearity with country dummies). Furthermore, as they may be highly correlated, they cannot all enter simultaneously.

[7] All the institutional indices used in the empirics are taken from the OECD. They all range between 0 and 6, with values close to 6 indicating a very stringent market while values close to 0 mean a very market-friendly environment.

bureaucratic procedures for setting up a new business or start-up costs, and poor legislation.[8] High barriers to entrepreneurship are associated with weak product market competition that lead once again to efficiency losses. The third index of institutional rigidities is 'barriers to competition' (*Bar.Comp*). It reflects market distortions that prevent fair competition and lead once again to inefficiencies. The last specification presented in Table 2 includes 'barriers to FDI' (*Bar.FDI*), i.e. impediments and obstacles that restrain inward FDI investment. These can be harmful to export performance: there is a long tradition in the FDI literature that highlights the role of foreign capital stock in promoting technological expertise and knowledge spillovers (De Mello, 1997, Braconier and Sjöholm, 1998).

3.3 Export performance and institutional rigidities: A baseline specification

In Table 1, we begin with a benchmark testable equation with four key variables:

$$\begin{aligned} Exp_{c,t} = \beta_0 + \beta_1 RULC_{c,t} + \beta_2 Ins_c^h + \beta_3 \left(1 + \theta Ins_c^h\right) R\,\&\,D_{c,t} \\ + \beta_4 Tax_{c,t} + \beta_5 (Tax)_{c,t}^2 + \beta_6 Soc_{c,t} + u_{c,t} \end{aligned} \qquad (9)$$

Where, for each country *c* in our sample and at time *t*: *Exp* is the export share relative to total exports of OECD countries*; RULC* indicates unit labour costs relative to OECD; *Tax* is the share of total tax revenue relative to GDP; *SOC* is the share of social, therefore non-productivity-enhancing, expenditures to GDP; *R&D* stands for the share of private R&D in GDP. The relevance of all these key variables was discussed above.[9] We have commented on the institutional features, introduced both on their own and multiplicatively with R&D, in sub-section 3.2 above.

INSERT TABLE 1 HERE

Our pooled OLS baseline estimates for (9) are shown in Table 1.[10] We control for heterogeneity across countries by augmenting (9) with fixed effects (country dummies) as well as controlling for common global macroeconomic shocks using year dummies: The F-test and associated p-values at the bottom of the Table refers to the joint statistical significance of these dummies. On the whole, these results present a successful basic model of export performance with institutional characteristics (on which more below) and government size alongside more standard arguments. The estimated coefficient of *RULC* is negative confirming the adverse effect of cost performance on exporting

[8] We refer the reader to Nicoletti *et al*. (1999) for the exact definitions of these indices as well as their empirical construction. Table B1 of the online Appendix displays mean values for the countries of our sample.
[9] As all variables, including the dependent one (export share), are shares or ratios, therefore bounded between 0 and 1, they were considered as I(0) variables.
[10] The intercept is not reported; in any case, it was dropped when fixed effects were allowed for.

activity. The private R&D-GDP ratio is on the whole significantly positive, indicating that the ability of OECD countries to innovate and provide differentiated products in international markets constitutes a crucial source of competitive edge. The coefficient of social expenditure *Soc* is significantly negative confirming the findings of Alesina and Perotti (1997). The level term of the tax share is positive and significant its quadratic term is significantly negative, suggesting that the export-state size relationship can be more accurately described by a hump-shaped curve, along the lines explored in Section 2 and echoing Barro (1990).

The institutional variables show up significant on their own but not always with the expected sign; barriers to entry and to competition appear with a positive sign on their own. The interaction terms between each of these rigidities and R&D are negative and significant, confirming the theoretical priors: The higher is the degree of market rigidity (higher values for any of Ins^{h}), the lower is the impact of a higher R&D-GDP ratio on export performance.

INSERT TABLE 2 HERE

Table 2 replicates the specification of Table 1 with the augmentation of three additional variables in the same line of argument with Carlin *et al*. (2001). These variables are TFP growth (TFP), Human Capital (HC) and property rights (Rights). TFP accounts for disembodied technical change (source: OECD-Productivity Statistics database); human capital is measured as the share of population with a University degree (Source: Barro-Lee data set (2013)) and represents the quality of labour force in a country while the index of property rights is a composite index that measures the quality of legal system and the protection of property rights (Source: Economic Freedom of the World (EFW) database (2014)).[11] This index takes values from 0 to 10[12] and indicates how effectively the protective functions of the government are performed. Values closer to the upper bound imply a country with an effective legal system. We assume that the Rights index captures- in a broadly defined manner- the quality of the institutional framework that is essential for the efficient function of the market The estimated coefficients of the three new variables are significant and with the expected signs. The institutional variables now appear mostly significant and with the expected signs (negative) both on their own and in their interactions with R&D. Otherwise, little else changes from Table 1 in either the

[11] The Rights index used in this paper is slightly different from the corporate ownership used in Carly et al. (2001) but we believe that our index is also appropriate in reflecting to what extent the institutional environment protects and promotes productive activity. In other words, countries with high degree of economic freedom are those that enjoy a highly effective system of legal protection.

[12] The Rights index is formed by four sub-components that all capture aspects of legal system, these are: the rule of law, property rights, independence of the judiciary and impartial and effective enforcement of the law.

sign or significance of the other regressors or the measures of fit. Results in Table 2 clearly suggest that the inclusion of factors that measure country's capacity in terms of either exogenous technological progress or quality-adjusted labour does not alter the importance of taxation on country's international competitiveness.

The optimal (export performance-maximising) tax share implied by the estimates is shown as $\hat{\tau}$; this is the empirical counterpart to $\overline{\tau}$ in (8). It is related to the estimated coefficients as follows, considering (9); as the empirical variable Tax≡100*τ, the tax-GDP ratio that maximises export performance is given by differentiating (9):

$$\hat{\tau} = \frac{\beta_4}{200\beta_5} \tag{10}$$

Based on (10) and estimates in Tables 1 and 2, the tax share ($\hat{\tau}$) that maximises export shares in international markets is of the order of 40-45%. These figures should be interpreted with extra cautiousness as the present measure of Tax share covers both redistributive transfers and productive government spending. In order to purge the effect of redistributive transfers in the previous estimate, we calculate a more narrowly defined variable of productive government spending that excludes redistributive transfers from government consumption (as % of GDP). When this variable is entered in the regressions instead of tax share the implied 'best' (export share-maximising) government size appears to be in the order of 16%.[13]

4. Sensitivity Analysis for Baseline Specifications

We next implement some sensitivity analysis to test the robustness of our main results shown in Tables 1 and 2. The main focus of these robustness checks is to control for endogeneity bias as well as to capture the dynamics in the exports share equation.

4.1 Accounting for potential endogeneity bias: IV estimation

INSERT TABLE 3 HERE

The exogeneity assumption underpinning the OLS estimates of Tables 1 and 2 may be too strong, as the causality between exports and the relative unit labour cost (*RULC*) can be two-way. For example, export expansion is likely to increase profitability, encouraging workers to request higher wages

[13] These estimates are available from the authors upon request.

leading thus to higher labour compensation and *RULC*.[14] Two strategies are followed to mitigate the potential endogeneity bias. Firstly, lag all regressors in (9) once, so as to satisfy the assumption of weak exogeneity; the results are shown in column 1 of Table 3. In this case, the OLS can still provide unbiased estimates. Nonetheless, this modification does not preclude the possibility that current export shares might cause feedback effects to future values of *RULC*, thus violating strict exogeneity. For unbiased results in this case, we use Instrumental Variables (IV). We use contemporaneous and one year lag values of GFCF, and ENE as instruments, where GFCF is the gross fixed capital formation-GDP ratio and ENE is the energy of oil equivalent per capita.[15]

Table 3 reports the results for specifications that control for endogeneity bias. The dependent variable is the export share in total (OECD) exports (*Exp*); results for the export-GDP ratio are similar and not shown for economy of space. At the bottom of the Table 3 values of key diagnostic tests are reported: The Wald test refers to hypothesis whether the regressors included are jointly statistically significant. The Davidson-MacKinnon statistic tests the exogeneity assumption, under the null this statistic it is distributed as F(m, N-K), where m is the number of potentially endogenous variables. A rejection of the null casts doubt about the validity of OLS estimates. The Sargan-Hansen statistic tests the orthogonality condition for a panel and is distributed under the null as $\chi^2_{L\text{-}K}$, where L is the number of excluded instruments in the original equation and K is the number of regressors. Intuitively, Sargan-Hansen tests the validity of instruments, a non-rejection of the null indicates that the instruments used identify correctly the equation. Estimates in Table 3 are very similar to those obtained from OLS in Tables 1 and 2. Assuming weak exogeneity between *RULC* and export shares affects only the significance of the *R&D* coefficient. Regarding the institutional variables, either on their own or interacted with R&D, estimates are consistent with the results of Table 1 and 2. Taken as a whole, this sensitivity test indicates that results from OLS baseline specifications are not biased severely from unobserved measurement errors and endogeneity bias, maintaining the main message that institutional rigidities influence negatively export shares while state size has a non-linear relationship with export performance.

4.2: Dynamic Panel specifications

Equation (9) which underpins the results of Tables 1 to 3 represents a static long-run equilibrium relation between exports and the various export determinants. It does not allow for country differences in the speed of adjustment towards the long-run equilibrium. The dynamic specification (9′) below

[14] If so, the relation would be positive, not the negative one shown by the estimated parameters. But the key thing is, there is potentially reverse causality between the two variables.
[15] Data are taken from World Bank Development Indicators.

allows for different adjustment process in each country which is another way to capture idiosyncratic differences. To this end, (9) is augmented to:

$$Exp_{c,t} = \gamma_0 + \left(\Gamma + \theta Ins_c^h\right) Exp_{c,t-1} + \gamma_1 RULC_{c,t} + \gamma_2 R\&D_{c,t} + \gamma_3 Tax_{c,t} + \gamma_4 (Tax)_{c,t}^2 + \gamma_5 Soc_{c,t} + u_{c,t} \quad (9')$$

By allowing for a variable speed of adjustment, (1-(Γ+θ Ins^h)), this structure allows us to identify the factors driving this speed. The coefficient of adjustment now includes the interaction with an institutional index *h*; these institutional features now are a slightly different set: Ins^h, h=*EPL, Bar.Enter, PMR*, where *PMR* is an index of product market regulation (measured in a similar fashion as the other indicators, from 0 – least regulated, to 6 – most restrictively regulated; source: OECD). Under the null hypothesis of instantaneous adjustment, the estimated coefficient of the lagged dependent variable is zero while the alternative suggests that there is partial adjustment. Therefore, a positive estimate of θ can be regarded as evidence that countries with high degree of institutional inflexibility in a particular aspect of economic activity adjust more slowly to long run equilibrium.[16] The presence of a lagged dependent variable in (9′) implies that a fixed effects estimator will be biased. The size of the bias as shown in Nickell (1981) depends on panel dimensionality; it is decreasing in the number of years, so for a sufficient number of years the potential bias converges to zero. In our data set the number of years (T= 25) and greater than the number of countries (N=18) and thus we estimate (9′) using a Dynamic Least Squared Dummy (DLSD) variable estimator as suggested in Everaert and Pozzi (2007)

ENTER TABLES 4 AND 5 HERE

Results from dynamic specification (9′) are shown in Table 4. The long-run coefficients are obtained by the following transformation: $\frac{\gamma_j}{1-\Gamma}$. These long-run coefficients are shown in Table 5. FE coefficients from dynamic specification are smaller than the static ones reported in Table 1 mainly due to the presence of the lagged dependent variable. The coefficients are on the whole insignificant with the exception of *RULC* that remains significant at 1%. The non-linear structure of taxation is still present; however both terms are far from significant levels and the implied export share-maximising tax shares now lies between 26% and 31.5%. Regarding institutions, not all variables play the same

[16]Due to the fact that the institutional indices change very slowly over time, we consider sample mean for each country.

role in the convergence process towards the long-run equilibrium. In the first column of Table 5, the interacted term of lagged export share with employment protection legislation (*EPL*) is insignificant while chronic rigidities in product market regulation (*PMR*) and entrepreneurship (*Bar.Enter*) are shown to significantly decelerate the speed of adjustment.

A potential deficiency of a fixed effects estimator is the homogeneity assumption imposed to all slope coefficients except that of the lagged dependent variable and the intercept. This restriction does not allow us to investigate the short-run dynamics of different variables. For that purpose, we also consider a Pooled Mean Group (PMG) estimator of Pesaran *et al*. (1999) that permits all short–run coefficients to differ across countries while maintains homogeneity of long run elasticities in variables of interest. The following model is specified for the PMG procedure:

$$\begin{aligned}\Delta exp_{c,t} = & -\lambda_c (exp_{c,t-1} - a_1 RULC_{c,t} - a_2 R\&D_{c,t} - a_3 Tax_{c,t} - a_4 Soc_{c,t} - a_{0,c}) \\ & + b_{1,c}\Delta RULC_{c,t-1} + b_{2,c}\Delta R\&D_{c,t-1} + b_{3,c}\Delta Tax_{c,t-1} + b_{4,c}\Delta Soc_{c,t-1} + \\ & + d_{1,c}\Delta RULC_{c,t-2} + d_{2,c}\Delta R\&D_{c,t-2} + d_{3,c}\Delta Tax_{c,t-1} + d_{4,c}\Delta Soc_{c,t-1} + u_{c,t}\end{aligned} \qquad (9'')$$

where λ is the speed of adjustment to long run relationship, parameters a stand for the long run elasticities of export shares and parameters *b* and *d* denote the coefficients of short run dynamics.[17]

ENTER TABLES 6 AND 7 HERE

The PMG estimates are reported in Table 6. The corresponding estimates of first and second order differences for individual countries are reported in Table 7. Export performance is negatively associated with *RULC*, Tax and Social expenditure shares and positively related to R&D. These estimates as well as all estimates from static specifications throughout the paper establish a robust result about the long-run negative effect of state size in export performance. The short-run coefficients in Table 7 are not always telling the same story. The coefficient of first order tax share difference is positive in 11 out of 18 countries while the coefficient of second order tax difference is positive only in 8. The pattern of R&D coefficient in first and second order differences is negative in many countries indicating the time required for innovative activity to be converted into substantial export gains. A broad conclusion from the comparison of short- and long-run estimates is that temporary increases in government size influence positively export performance while permanent movements in

[17] We currently choose a lag structure up to 2 years to ensure enough degrees of freedom required for supporting statistical inference.

government size impact negatively on exports. Such a pattern signifies the existence of a non-linear relationship as documented in all Tables throughout the paper.

Overall, the results from both static and dynamic specifications reveal a new message which has not been highlighted in the literature so far. Nickell *et al*. (2008) have found that strong protectionism in the labour market slows down the speed of dynamic adjustment preventing a fast reallocation of resources. The findings of the present study suggest that a high degree of protection in the labour market is not very costly and its negative impact on the reallocation of resources is only minor (Tables 1, 2, 3 and 4). From the present analysis, it becomes apparent that there are other institutional rigidities more damaging for a country's international competitiveness. So far gone unnoticed, this finding has a critical policy implication: countries that seek to increase export market shares should implement reforms that eliminate barriers to competition and other product market-related chronic inefficiencies rather than attempting labour market liberalising policies.

5. Summary and conclusions

This paper investigates the role of government size and labour and product market 'institutions' (features and rigidities) in determining export performance of OECD economies. We view the current state of the literature on empirical export performance as suggesting that competitiveness and unit labour costs are quite important determinants but do leave room for improvement in the explanation of export shares, an argument exemplified by Carlin *et al.* (2001). In addition to the 'deep' structural/institutional characteristics suggested in that paper as further determinants, there are good grounds to argue that government size may also play an important explanatory role. Following the reasoning of Barro (1990), the role of this variable is likely to be non-linear. Thus, our main contribution is to investigate the (possibly non-linear) role of government size and various institutional features in shaping export performance, in addition to the role of unit labour costs and competitiveness. To this end, we first present a theoretical model of export performance, whose role is to formalise and sharpen these insights. The model, an extension of Dornbusch, Fischer and Samuelson (1997) with monopolistic competition, also includes a role for government, trade unions, and other labour market institutional features. Indeed, both sets of variables, government size and institutions, are shown to be relevant, the former in a Barro (1990)-type non-linear way.

Our results may be summarised as follows. Among the variables traditionally emphasised as determinants of international export shares, relative unit labour costs and the share of R&D expenditures in GDP continue to play a significant role in the expected way. Our contribution is that

we uncover a significant role for government in shaping export performance: The estimated coefficients of the tax shares in GDP, as measures of the size of government and public services, and their quadratic terms verify the pattern suggested by the previous theoretical arguments in a consistent fashion. These terms are almost always significant, revealing a non-linear effect on export shares that implies an export-maximising government size (total tax receipts as a share of GDP) of the order of around 40-45% of GDP. The share of productive government spending that maximises export performance is much lower, however, around 16%. To our knowledge, there is little precedent in estimating an optimal government size along these lines; hence this is a new contribution that sheds light to a new aspect that is the link between government size and international competitiveness. We perform a range of robustness checks related to alternative measure of export performance, and accounting for a potential endogeneity bias via IV estimation, and dynamics.

The institutional features we consider include measures of labour market rigidity (strength of trade unionism and employment protection) and product market rigidity (barriers to entrepreneurship, competition, FDI and a measure of product market regulation). On the whole, the econometric analysis reveals a significant role for institutional rigidities. This type of institutional stringency has been found to be distortive for international competitiveness and as our results show their negative effect on export shares is via reducing the effectiveness of R&D. Quite independently of the tax share, social expenditure, which is entirely non-productive in nature, maintains a robust negative sign clearly establishing a negative role of the welfare state regarding export performance, as suggested by Alesina and Perotti (1997): The obvious interpretation is that the funds for implementing a welfare policy are derived from taxation, causing a loss of efficiency and harming competitiveness. We also uncover evidence that product market regulation and barriers to entrepreneurship decelerate the speed of adjustment to new equilibria and therefore slow down the response of the economy to policy initiatives. Finally, both static and dynamic specifications reveal that barriers to competition and other product market-related distortions are more damaging for a country's export performance international competitiveness than labour market-related rigidities.

In all, these results should be both interesting contributions to the literature and policy recommendations as countries strive to reform their institutions and try to forge successful export-oriented recovery strategies. The key recommendation is that countries should pursue export-promotion based on the dual strategy of targeted, productive public services and a dynamic product market avoiding the institutional rigidities highlighted in this study.

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Table 1: Export performance among OECD countries, 1980-2005; Baseline Estimates

	Spec1	Spec2	Spec3	Spec4
RULC	-3.877***	-4.117***	-3.735***	-4.588***
	(-5.57)	(-6.25)	(-5.74)	(-6.96)
R&D	-0.350	5.097***	2.780***	3.277***
	(-0.40)	(5.48)	(3.11)	(5.55)
EPL	-0.374***			
	(-2.90)			
Bar.Enter		11.031***		
		(16.76)		
Bar.Comp			1.224***	
			(2.79)	
Bar.FDI				-6.383***
				(-11.82)
R&D×EPL	0.362			
	(0.87)			
R&D×Bar.Enter		-2.150***		
		(-5.00)		
R&D×Bar.Comp			-1.163**	
			(-2.53)	
R&D×Bar.FDI				-1.978***
				(-5.10)
Tax	0.282***	0.323***	0.282***	0.307***
	(4.48)	(5.59)	(4.58)	(5.37)
(Tax)2	-0.003***	-0.004***	-0.003***	-0.004***
	(-4.07)	(-4.88)	(-3.83)	(-4.65)
Soc.Share	-0.043***	-0.035***	-0.034***	-0.030***
	(-3.68)	(-3.47)	(-3.22)	(-2.91)
Country Dummies	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes
Observations	438	438	438	438
Adjusted R^2	0.9853	0.9864	0.9857	0.9862
F	855.905	912.759	916.766	926.027
p	0.000	0.000	0.000	0.000

The dependent variable is the share of exports relative to total OECD exports. Numbers in brackets below coefficients refer to absolute t-statistics. Asterisks denote significance as: *** at 1%, ** at 5%. These are OLS estimates robust for arbitrary group-wise heteroscedasticity. Coefficients reported are semi-elasticities calculated at the sample mean of each variable. The F-statistic refers to the joint significance of country dummies.

Table 2: Export performance among OECD countries, 1980-2005; augmented model

	Spec1	Spec2	Spec3	Spec4
RULC	-4.178***	-4.101***	-4.042***	-4.990***
	(-5.58)	(-5.80)	(-5.66)	(-7.29)
R&D	0.019	3.818***	1.427*	3.360***
	(0.02)	(4.45)	(1.75)	(5.42)
Tax	0.372***	0.385***	0.363***	0.403***
	(4.73)	(5.38)	(4.65)	(5.67)
(Tax)2	-0.004***	-0.005***	-0.004***	-0.005***
	(-4.67)	(-5.05)	(-4.36)	(-5.32)
Soc.Share	-0.019	-0.009	-0.015	-0.001
	(-1.48)	(-0.77)	(-1.17)	(-0.10)
EPL	-0.635***			
	(2.83)			
Bar.Enter		-6.980***		
		(18.83)		
Bar.Comp			-15.514***	
			(13.83)	
Bar.FDI				-6.928***
				(-10.03)
R&D×EPL	0.085			
	(0.22)			
R&D×Bar.Enter		-1.634***		
		(-4.10)		
R&D×Bar.Comp			-0.591	
			(-1.42)	
R&D×Bar.FDI				-2.167***
				(-5.31)
TFP	0.397***	0.320***	0.367***	0.446***
	(3.89)	(3.41)	(3.51)	(4.64)
HC	0.109***	0.131***	0.110***	0.133***
	(3.43)	(4.36)	(3.53)	(4.49)
Rights	0.501***	0.398***	0.479***	0.463***
	(3.87)	(2.70)	(3.54)	(3.20)
Country dummies	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes
Observations	413	413	413	413
Adjusted R^2	0.9864	0.9870	0.9865	0.9877
F	716.829	705.720	650.819	640.177
p	0.000	0.000	0.000	0.000

The dependent variable is the share of exports relative to total OECD exports. Numbers in brackets below coefficients refer to absolute t-statistics. Asterisks denote significance as: *** at 1%, ** at 5%. These are OLS estimates robust for arbitrary group-wise heteroscedasticity. Coefficients reported are semi-elasticities calculated at the sample mean of each variable. The F-statistic refers to the joint significance of country dummies.

Table 3: Export performance among OECD countries, 1980-2005: IV Estimation

	OLS	IV	IV	IV	IV	IV
RULC(t-1)	-3.21***					
	(-5.04)					
R&D(t-1)	0.57***					
	(3.65)					
Tax(t-1)	0.34***					
	(5.90)					
$(Tax)^2$(t-1)	-0.00***					
	(-5.38)					
Soc.Share	-0.03***					
	(-3.24)					
RULC		-5.12***	-5.12*	-6.90***	-4.48	-6.76***
		(-4.08)	(-1.88)	(-4.51)	(-1.39)	(-2.66)
R&D		0.35*	-0.05	5.67**	2.47	3.64***
		(1.88)	(-0.05)	(2.18)	(0.99)	(3.05)
Tax		0.27***	0.27**	0.29**	0.27**	0.28**
		(3.62)	(2.10)	(2.33)	(2.12)	(2.26)
$(Tax)^2$		-0.01***	-0.003*	-0.004**	-0.003*	-0.004*
		(-3.14)	(-1.92)	(-2.00)	(-1.84)	(-1.89)
Soc.Share		-0.037**	-0.037	-0.022	-0.032	-0.022
		(-2.48)	(-0.87)	(-0.72)	(-0.91)	(-0.57)
EPL			-19.37***			
			(-14.07)			
Bar.Enter				-37.17***		
				(46.12)		
Bar.Comp					-24.53***	
					(10.71)	
Bar.FDI						-29.5***
						(-33.28)
R&D×EPL			0.21			
			(0.39)			
R&D×Bar.Enter				-2.43**		
				(-2.02)		
R&D×Bar.Comp					-1.01	
					(-0.80)	
R&D×Bar.FDI						-2.24***
						(-2.73)
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
-Observations	421	421	421	421	421	421
Adjusted R^2	0.985		0.985	0.985	0.985	0.985
F	1004					
p	0.000					
Wald		29600	29574	31263	30464	31206
Davidson-		6.23	5.99	2.65	1.07	5.10
MacKinnon		(0.01)	(0.01)	(0.10)	(0.30)	(0.02)
Sargan-Hansen		3.806	4.170	2.145	11.480	7.52
		(0.28)	(0.24)	(0.54)	(0.01)	(0.05)

The dependent variable is the share of exports relative to total OECD exports. Numbers in brackets below coefficients refer to t-statistics. Asterisks denote significance as: *** at 1%, ** at 5%. The endogenous variable in IV estimations is RULC; the instruments are GFCFt, GFCFt-1, ENEt and ENEt-1.The Wald test concerns the joint statistical significance of the regressors. Davidson-MacKinnon tests for exogeneity and Sargan-Hansen tests the orthogonality condition for a panel. See

the text for more information about the distribution of these statistics. Numbers in parentheses refer to p-values of diagnostic tests. All estimates are consistent for cluster (country) robust heteroscedasticity.

Table 4: Export performance among OECD countries, 1980-2005: Dynamic Least Squared Dummy Variable (DLSD) Estimator

	Spec1	Spec2	Spec3
Exp(t-1)	0.783***	0.546***	0.625***
	(12.93)	(4.72)	(8.45)
Exp(t-1)×EPL	0.019		
	(0.74)		
Exp(t-1)×Bar.Enter		0.110**	
		(2.36)	
Exp(t-1)×PMR			0.101**
			(2.16)
RULC	-0.658**	-0.811***	-0.738***
	(-2.69)	(-3.02)	(-3.28)
R&D	0.033	0.058	0.040
	(0.30)	(0.56)	(0.39)
Tax	0.063	0.055	0.052
	(1.45)	(1.16)	(1.10)
(Tax)2	-0.001	-0.001	-0.001
	(-1.49)	(-1.32)	(-1.22)
Soc.Share	-0.014	-0.011	-0.012
	(-1.20)	(-1.11)	(-1.12)
Country Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	No	No	No
Observations	420	420	420
Adjusted R^2	0.7107	0.7129	0.7124
F	801.990	578.080	636.803
p	0.000	0.000	0.000

The dependent variable is the share of exports relative to total OECD exports. Numbers in brackets below coefficients refer to t-statistics. Asterisks denote significance as: *** at 1%, ** at 5%. The estimator used is a dynamic least squared dummy (DLSD) variable estimator with bootstrap corrected standard errors following the approach of Everaert and Pozzi (2007).

Table 5: Implied long-run estimates from Within Fixed Effects Estimator

RULC, $\frac{\gamma_1}{1-\Gamma}$	-2.917	-1.691	-1.894
R&D, $\frac{\gamma_2}{1-\Gamma}$	0.267	0.179	0.170
Tax, $\frac{\gamma_3}{1-\Gamma}$	0.290	0.119	0.138
Soc, $\frac{\gamma_4}{1-\Gamma}$	-0.065	-0.024	-0.032

Notes. The three columns of this Table draw on the estimated coefficients shown in the corresponding three columns of Table 4.

Table 6: Export performance among OECD countries, 1980-2005: Pool Mean Group Estimator for Long Run Elasticities

	PMG
Long Run Estimates	
RULC	-4.512***
	(-5.56)
R&D	6.461***
	(7.57)
Tax	-0.135***
	(-4.68)
Soc.Share	-0.030***
	(-3.13)
Short Run Coefficients	
Convergence Coefficient	-0.124***
	(-2.62)
Δ.RULC(t-1)	1.689
	(0.44)
Δ.RULC(t-2)	1.618
	(0.70)
Δ.R&D(t-1)	-0.214
	(-0.20)
Δ.R&D(t-2)	-0.630
	(-0.57)
Δ.Tax(t-1)	-0.023
	(-0.34)
Δ.Tax(t-2)	0.005
	(0.12)
Δ.Soc.Share(t-1)	-0.067
	(-1.54)
Δ.Soc.Share(t-2)	-0.073
	(-0.77)
Constant	1.447**
	(2.16)
Observations	402
Log-Likelihood	249.498

The dependent variable is the share of exports relative to total OECD exports. Numbers in brackets below coefficients refer to z-statistics. Asterisks denote significance as follows, *** 1%, **5%. A constant is also included. Short run estimates are the means of the estimated coefficients across 18 countries, individual country estimates are shown in Table 7.

Table 7: Short Run Coefficients of Pooled Mean Group Estimators (PMG) for Individual Countries

	Δ RULC$_{t-1}$	Δ RULC$_{t-2}$	Δ R&D$_{t-1}$	Δ R&D$_{t-2}$	Δ Tax$_{t-1}$	Δ Tax$_{t-2}$	Δ Soc$_{t-1}$	Δ Soc$_{t-2}$
Australia	-1.629	1.884	0.046	0.189	-0.018	-0.002	-0.039	-0.039
	[-1.16]	[1.95]	[0.06]	[0.26]	[-0.38]	[-0.07]	[-0.93]	[-1.21]
Austria	-1.868	0.958	3.075*	-3.529**	0.005	-0.008	0.002	-0.002
	[-0.68]	[0.54]	[2.20]	[-2.86]	[0.14]	[-0.32]	[0.09]	[-0.22]
Belgium	3.785	-0.411	-5.509*	2.341	0.186	0.181	-0.058	0.104
	[0.58]	[-0.10]	[-2.52]	[1.75]	[0.73]	[1.21]	[-0.44]	[1.47]
Denmark	-0.349	0.688	-0.895	-0.065	-0.046	0.031	-0.056	0.053
	[-0.21]	[0.49]	[-1.35]	[-0.15]	[-1.94]	[1.72]	[-1.54]	[1.36]
Spain	0.95	-0.077	1.327	-0.098	-0.171**	0.048	-0.043	0.021
	[0.40]	[-0.04]	[0.74]	[0.10]	[-2.87]	[1.13]	[-0.81]	[0.43]
Finland	-2.307*	0.689	-0.413*	0.342	0.019	-0.016	-0.024*	0.01
	[-2.31]	[1.12]	[-2.25]	[1.88]	[1.09]	[-1.70]	[-2.55]	[0.86]
France	-4.739	-0.455	-0.21	2.107	-0.369*	0.151	0.138	-0.057
	[-0.73]	[-0.07]	[-0.07]	[1.13]	[-2.05]	[1.32]	[1.27]	[-0.67]
Germany	13.102	-0.542	-0.992	0.165	-0.444	0.152	-0.012	0.343
	[0.75]	[-0.04]	[-0.25]	[0.05]	[-1.02]	[0.56]	[-0.03]	[1.18]
Greece	0.184	0.008	-0.694	0.245	0.007	-0.002	0.007	0.015
	[0.38]	[0.03]	[-0.77]	[0.30]	[0.81]	[-0.44]	[0.32]	[1.13]
Ireland	-5.022***	1.543	-0.035	-0.034	0.005	-0.015	-0.01	0.003
	[-4.39]	[1.25]	[-0.08]	[-0.06]	[0.30]	[-1.29]	[-0.73]	[0.28]
Italy	-1.733	-0.175	-8.445**	3.145	0.118	-0.033	-0.09	0.213
	[-0.50]	[-0.06]	[-3.02]	[1.61]	[1.42]	[-0.73]	[-0.50]	[1.63]
Japan	60.160**	-2.807	10.006**	-17.34***	-0.595*	0.36	-0.566	-1.54***
	[2.86]	[-0.25]	[2.90]	[-4.33]	[-2.35]	[1.72]	[-1.09]	[-3.34]
Korea	-6.160***	3.117***	-4.789***	1.574**	0.744***	0.427***	0.160***	-0.06***
	[-5.01]	[3.63]	[-3.89]	[2.94]	[4.34]	[-3.93]	[4.97]	[-3.46]
Netherlands	3.004	-13.099*	-2.018	3.618**	-0.160*	0.102*	0.085	0.116
	[0.52]	[-2.48]	[-1.07]	[2.63]	[-2.34]	[2.18]	[0.63]	[1.11]
Portugal	-1.002	0.737	-0.532	0.296	0.042*	-0.011	0.004	-0.002
	[-1.64]	[1.68]	[-0.83]	[0.55]	[2.36]	[-1.08]	[0.24]	[-0.16]
Sweden	-3.801*	2.762*	-0.376*	-0.17	0.011	0.022	-0.055	0.03
	[-2.10]	[2.01]	[-2.29]	[-1.07]	[0.49]	[1.23]	[-1.87]	[1.51]
UK	2.547	-3.858	-2.798	1.683	0.077	-0.083	-0.155	0.013
	[0.49]	[-1.10]	[-1.07]	[0.79]	[0.64]	[-1.17]	[-1.18]	[0.10]
USA	-24.722	38.16	9.406**	-5.8	0.18	-0.36	-0.501	-0.52
	[-0.77]	[1.77]	[2.81]	[-1.87]	[0.54]	[-1.46]	[-0.79]	[-0.84]

Notes. Numbers in brackets below coefficients refer to absolute z-statistics. Asterisks denote significance as follows, *** 1%, **5%. These are individual coefficients for each country from estimated in Table 6.

Appendices

Appendix A: Data Sources

Variable	Source
Exports as share to total OECD	UNCTAD
RULC	EUKLEMS
Tax share	OECD-National Accounts
Social Expenditure share	OECD-National Accounts
Private R&D share	OECD-Science and Technology Indicators
EPL	OECD-Employment Database
PMR	OECD- Product Market Regulation Database
Barriers to Entrepreneurship	OECD- Product Market Regulation Database
Barriers to Competition	OECD- Product Market Regulation Database
Barriers to FDI	OECD- Product Market Regulation Database
Multi Factor Productivity Growth (TFP)	OECD-Productivity Statistics
Human Capital	Barro-Lee Data Set
Property Rights	Economic Freedom of the World (EFW)
Gross Fixed Capital Formation (GFCF) as share to GDP	World Bank Development Indicators
Energy of oil Equivalent (ENE) per Capita	World Bank Development Indicators

Appendix B: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Export share	438	5.71	5.61	0.27	21.99
RULC	450	1.00	0.18	0.74	1.69
Tax share	450	35.70	8.40	15.65	52.26
Social Expenditure share	450	20.98	6.28	3.00	36.20
Private R&D share	450	1.01	0.63	0.03	2.96
EPL	450	2.14	0.91	0.21	3.63
Barriers to Entrepreneurship	450	2.25	0.45	1.45	3.05
Barriers to Competition	450	2.41	0.52	1.72	3.22
Barriers to FDI	450	1.59	0.74	0.09	2.92
TFP	450	1.37	1.6	-2.9	7.8
HC	450	7.16	5.78	0.39	30.04
Rights	450	7.41	1.91	1.36	9.6

Appendix C: Methodology of construction of RULC

Unit Labour Cost (ULC) combines information on: (i) cost per unit of labour input and (ii) an index of labour productivity. For country *c* at time *t*, we define *ULC* as follows (without subscripts):

$$ULC = \frac{W}{Y / N} \tag{C1}$$

W represents wages per worker measured as labour compensation per working hour while the lower ratio (*Y/N*) indicates labour productivity defined as value added per hour worked.[18] RULC aims at reflecting cost competiveness in country *c* relative to cost in other countries of the sample. For that purpose, we weight ULC with the sample arithmetic mean of *ULC* (denoted by an overbar):

$$RULC_{c,t} = \frac{ULC_{c,t}}{\overline{ULC_t}} \tag{C2}$$

For comparisons to be meaningful across countries, values in (C2) must be expressed in a common currency. We use Purchasing Power Parity (ppp)-exchange rate to express all values in constant 2000 USD; additionally, the mean unit labour cost is computed as:

$$\overline{ULC_t} = \frac{1/c - 1\left(\sum_{c=18} W\right)}{1/c - 1\left(\sum_{c=18} (Y / N)\right)} \tag{C3}$$

[18] The difference between *H* and *N* is that the former refers to total number of hours including self-employed while *N* refers only to total hours worked by employees.