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New Evidence on the Determinants of Industrial Specialisation

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NEW EVIDENCE ON THE DETERMINANTS OF INDUSTRIAL SPECIALISATION

ECONOMICS DEPARTMENTS WORKING PAPERS No. 1112

By Asa Johansson and Eduardo Olaberria

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ABSTRACT/RÉSUMÉ

New Evidence on the Determinants of Industrial Specialisation

Industrial specialization has important implications for economic performance; therefore, understanding its determinants is of key policy relevance. This paper quantifies the relationship between factor endowments, policies and institutions and patterns of industrial specialisation in production using a new cross-country dataset compiled by WIOD that includes 37 OECD and non-OECD countries and 26 sectors. An advantage of this database –as compared with those used by previous studies- is that makes it possible to look at industrial specialization in terms of value added instead of gross exports, covering both services and manufactures in a panel of advanced and developing economies. The empirical methodology is based on the idea that industries vary in the conditions that they need for production, and countries differ in their ability to provide for these industry-specific requirements. We find that not only cross-country differences in factor endowments, such as capital and labour, but also differences in investment in R&D and policies or institutions, such as financial development, tariffs and taxes, and product and labour market regulation, can explain cross-country differences in industrial structure.

JEL classification codes: O57; C23.

Key words: intermediate input tariff, trade.

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Nouveaux résultats sur les déterminants de la spécialisation industrielle

La spécialisation industrielle a des implications importantes pour les performances économiques. Il est, par conséquent, essentiel d'en comprendre les déterminants. Ce papier quantifie la relation entre les dotations en facteurs, les politiques et institutions et les modèles de spécialisation industrielle dans la production en utilisant une nouvelle base de données internationales compilée par WIOD, qui comprend 37 pays membres et non membres de l'OCDE et 26 secteurs. Un avantage de cette base de données, par rapport à celles utilisées par les études précédentes, est qu'elle permet d'analyser la spécialisation industrielle en termes de valeur ajoutée et non par la valeur des exportations brutes, et aussi qu'elle comprend les services et les produits manufacturés pour un groupe de pays avancés et émergents. La méthodologie empirique est basée sur l'idée que les industries diffèrent dans les conditions requises pour la production, et les pays diffèrent dans leur capacité à répondre à ces exigences spécifiques de l'industrie. Nous constatons que non seulement les dotations en facteurs, comme le capital et le travail, mais aussi les politiques ou les institutions, comme le développement financier, les tarifs et taxes, les investissements en R & D et la réglementation des marchés des produits et du travail, sont les principaux déterminants de la structure industrielle.

Classification JEL: O57; C23.

Mots clés: Droits de douane sur les biens intermédiaires, échanges

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NEW EVIDENCE ON THE DETERMINANTS OF INDUSTRIAL SPECIALISATION

By

Asa Johansson and Eduardo Olaberria[1]

1. Introduction

1. Industrial specialisation has important implications for economic performance. Both theory and evidence suggest that specialising in some industries can be more growth promoting than specialising in other industries. For example, in models with learning-by-doing externalities long run growth is endogenous and depends, among other things, on industrial specialisation (*e.g.* Matsuyama, 1992; Grossman and Helpman, 1991; Aghion and Howitt, 1998; Dalum *et al.*, 1999; and Barro and Sala-i-Martin, 2003). On the empirical side, evidence suggests that countries that specialise in high value added industries, such as electronics, are more likely to grow faster (Amable, 2000 and Hausmann *et al.*, 2007). Since industrial specialisation affects growth and has implications for wage inequality, understanding its determinants is of key policy relevance. The purpose of this paper is to explore this issue empirically to quantify the determinants of industrial specialisation. The general question asked in this paper is: Can international differences in factor endowments, policies and institutions explain international differences in industrial specialisation?

2. A driving force behind industrial specialisation is trade. Trade enables countries to specialise in a narrow range of goods in which the country is relatively more productive, leading to higher productivity growth and creating learning and scale effects. At the heart of conventional trade theory is the idea that international differences in production are determined by international differences in factor endowments. Various empirical approaches have been used to test the predictions of this theory, finding different results. The traditional approach to study specialisation assumes that all countries have access to the same technology (Harrigan, 1995; Davis and Weinstein, 1999; Reeve, 1998; Bernstein and Weinstein, 2002) and use cross-country data to estimate the association between factor endowments and the performance of a set of manufacturing industries. They find that increases in factor endowments, such as in the stock of capital per worker, have a positive and statistically significant impact on output in almost all manufacturing sectors. Other studies, such as Harrigan (1999) and Harrigan and Zakrajsek (2000), allow technology to differ across countries, and find that changes in factor endowments do not affect uniformly all industries. When factor endowments increase, GDP of some industries will increase while in some others it will decrease.

3. Recently, an increasing number of studies have also sought to quantify the role of policies and institutions for specialisation (*e.g.* Chor, 2010; Kowalski, 2011; Nunn and Trefler, 2013 and Johansson *et al.*, 2013), showing that they can have an important impact. In particular, they find that differences in institutional quality, financial development and employment regulation explain differences in countries manufacturing exports.

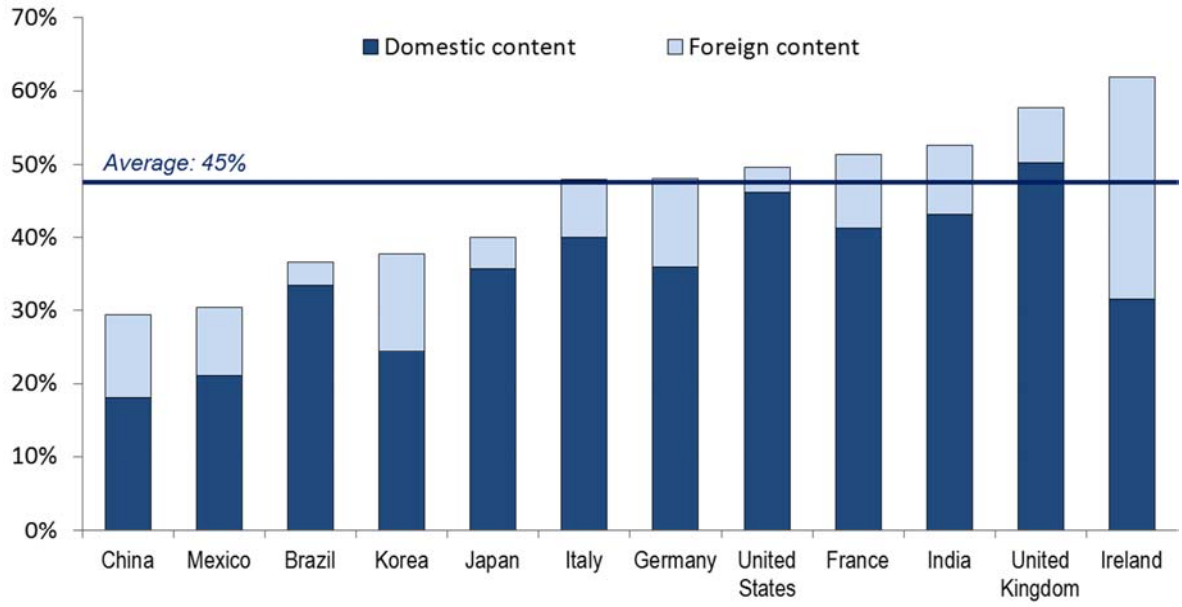
4. Both the recent and the older literature relied on data for manufacturing industries only (*e.g.* Harrigan, 1995; Harrigan, 1997; Davis and Weinstein, 1999; Chor, 2010; Kowalski, 2011; Johansson *et al.*, 2013). Yet services have, by far, the largest share in value added in most countries. Moreover, services

1 Asa Johansson is senior economist and Eduardo Olaberría is economist in the Policy Studies Branch. The authors would like to thank Giuseppe Nicoletti and Jean-Luc Schneider for their valuable comments and suggestions, Yassine Slaoui for his research assistance and Sarah Michelson for superb editorial assistance.

contribute, on average, 45% of the value added in gross exports of manufacturing goods and in some countries this share is even higher (Figure 1).

5. Furthermore, Chor (2010), Kowalski (2011) and Johansson *et al*. (2013) look at trade patterns rather than production specialisation. However, the focus on the value of gross exports can be misleading because a large portion of this value is value added by a different sector or country (Figure 2). Indeed, the internationalisation of economic activity and the sourcing abroad of intermediate inputs have made the relationship between trade and value creation more complex.[2] The domestic value added content of gross exports was significantly lower in 2009 than it was fifteen years earlier (Figure 3). Thus, there is a growing inability of gross exports to capture the value added by each sector and country, and therefore measures of specialisation based on gross exports can be misrepresentative (see Miroudot *et al*., 2009). A better measure of specialisation should be one based directly on the value added of each sector.

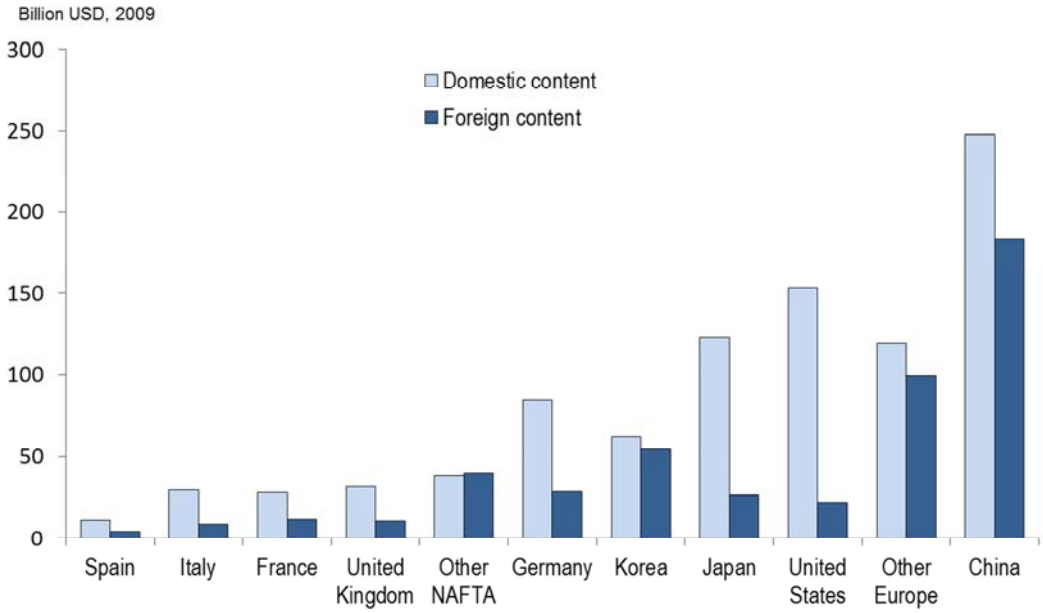
Figure 1. Services value added embodied in gross exports, 2009



Source: OECD TiVA database.

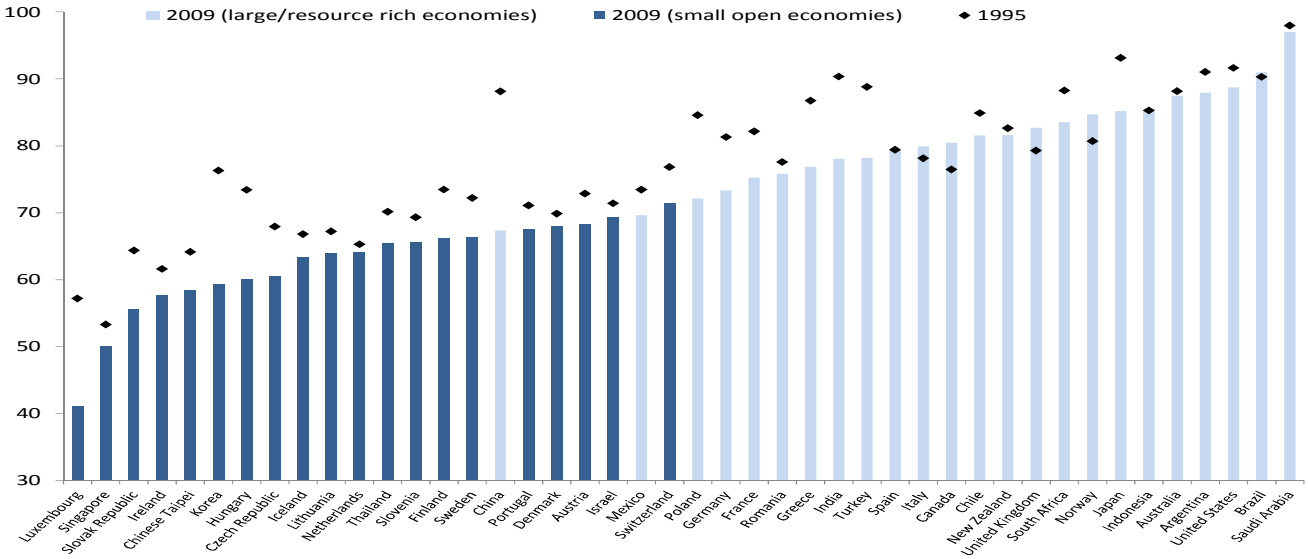
2. For example, Koopman et al. (2010) found that, in China, the export sector consists largely of assembly activities based on imported intermediate goods and that the value added of these activities was much lower than suggested by gross exports.

Figure 2. Domestic and foreign content in gross exports of electronics



Source: OECD TiVA database.

Figure 3. Share of domestic value added in gross exports across countries 1995 and 2009, %



Source: OECD TiVA database.

6. This paper re-examines the findings of previous studies using a different and novel database that enables to measure specialisation on a value added basis and to include services and manufacturing industries. The paper also extends the analysis to some policies and institutions not considered before. The analysis is based on the recently issued World Input-Output Database (WIOD), which is constructed out of national supply- and use tables in combination with bilateral trade statistics as described in Timmer *et al.*

(2012). This database distinguishes domestic value added for 37 industries and 40 emerging and developed countries.[3]

7. The analysis covers the period 1995-2009 which allows to account for the significant change observed in the pattern of globalisation since the mid-1990s (Haskel *et al.,* 2012), driven by three important factors: (1) the significant reduction in political barriers to trade[4]; (2) the decline in trade costs generated by the creation of the internet, which drove the cost of invoice and data to almost zero; and (3) the growth of GDP, and the corresponding share of world trade, of emerging countries accelerated in the mid-1990s, particularly in China, India, Russia and Brazil, thereby changing global specialisation patterns.

8. The empirical methodology follows Chor (2010) who specified a model in which the productivity of industries is driven by the interaction of country and industry characteristics. The intuition is simple: industries vary in the conditions needed for production and countries differ in their ability to provide for these conditions; hence, relative productivity across industries will be different in different countries. For example, industries that require a high share of highly skilled workers for production are likely to be relatively more productive and take a higher share of GDP in countries that are relatively well endowed with those workers. A similar argument applies for institutions and policies: *e.g.* in countries relatively more financially developed, industries that rely heavily on external financing are likely to grow faster and take a higher share of GDP than in countries with less developed financial markets.

9. Following this approach, this paper studies how capital per worker, the share of high skilled and low skilled workers, financial development, total R&D spending (both private and public; from now on only R&D spending), product and labour market regulation, and the structure of taxes and tariffs affect production specialisation. The three main findings are:

- *Factor endowments, policies and institutions are critical determinants of industrial specialisation.* The results confirm the findings of previous empirical studies: industries that are intensive in capital are larger (in terms of their value added over GDP) in countries that are relatively well endowed in capital; cross-country differences in education can significantly increase the value added share of industries intensive in human capital; industries that are relatively more dependent on external financing take up a larger share of GDP in countries with more developed financial markets (as measured by the ratio of credit to the private sector to GDP); relatively easier employment protection regulation and entry barriers can increase the share of GDP of industries facing high job turnover or high volatility of sales.

- *Investment in R&D and tax structure can affect industrial specialisation.* The results also suggest that industries that are highly dependent on innovation take up a higher share of GDP in countries that spend relatively more on research and development; and countries with higher labour taxes tend to specialise in industries that are less labour intensive. These findings are, to our knowledge, new in the empirical literature on the determinants of industrial specialisation.

- *Trade policy can also affect industrial specialisation*: tariffs on imported goods are likely to reduce value added in downstream industries, especially if these industries rely more on those protected intermediate goods.

3. Although WIOD has data for 40 countries, the explanatory variables are a limiting factor and at the end the sample includes 37 countries (see Table A1 in the appendix for a list of countries). Similarly, the analysis includes only 26 of the 37 industries to avoid sectors such as Public Administration or Health, that are likely to have different determinants than the ones considered in this paper.

4. At the multilateral level, after the 1994 Uruguay Round; several regional trade agreements were signed (e.g. NAFTA, Mercosur) and, in 2001, China accessed the World Trade Organization (WTO).

10. The remainder of the paper proceeds as follows. Section 2 describes the empirical methodology and the data used. Section 3 discusses the results and section 4 offers concluding remarks.

2. Empirical methodology and data

2.1 Empirical specification

11. To analyse the determinants of industrial specialisation, this paper adapts the empirical model proposed by Chor (2010) to estimate the determinants of exports. Chor's model incorporates factor endowments and policies as determinants of specialisation in exports. The identification strategy relies on the exogenous differential impact that factor endowments and policies have across different industries, based on the salient role played by a specific factor endowment or policy in each industry's production process. Instead of focusing on gross exports by industry, as Chor (2010), the analysis in this paper uses the value-added share of GDP of each industry as dependent variable. An additional advantage of measuring specialisation using value-added in production is that it is more closely related to trade theory. As explained by Harrigan (1997), the bulk of the intellectual content of trade theory is about production; however, almost all recent empirical works on the determinants of specialisation has used trade data and has not directly measured production.

12. The empirical specification is[5]:

$$IndShare_{\mathrm{ist}} = \alpha + \beta_1 Endowment_{\mathrm{it}} * Intensity_s + \beta_2 Policy_{\mathrm{it}} * Sensitivity_s + \beta_3 Tariff_{\mathrm{sit}} + \Theta_{\mathrm{i}} + \Theta_{\mathrm{st}} + \varepsilon_{\mathrm{ist}}$$

where *i* denotes country, *s* sector (industry) and *t* year. *Endowment* is a set of factor endowments at the country level, such as capital per worker and stock of human capital, which varies by country and year. *Intensity* measures the intensity with which industry *s* requires the use of the factor endowment. The interaction between *Endowment*, at the country level, and *Intensity*, at the industry level, captures the idea that conditions needed for production vary across industries, and countries differ in their ability to provide for these industry-specific requirements. Similarly, *Policy* denotes the policy and institutional variables, such as financial development, spending in R&D, regulations, etc., that are measured at the country-level. The policy variable is interacted with *Sensitivity*, which measures the sensitivity of industry *s* to the policy. Once again, the approach is based on the idea that due to some salient sectoral characteristics some sectors are inherently more affected than others by certain policies (*e.g.* Rajan and Zingales 1998).

13. The equation also includes a measure of tariffs. While Kowalski (2011) interacts tariffs with the share of imported intermediate inputs in that industry, to avoid the potential bias due to the fact that the share of imported intermediate inputs may be affected by tariffs, this paper uses a different tariff measure. In this measure (*Tariff*) the tariffs on good *Z* is weighted by the importance of that good in the production of industry *s*, as in Bas *et al.* (2013).[6] We construct a measure of tariffs at the industry level for each country in the sample and each manufacturing industry as the weighted average of tariffs on the

5 Since the dependent variable is a proxy for production specialisation not trade, the estimation does not include gravity forces as explanatory variables.

6 We also run regressions including, as an additional variable, output tariffs, but the results were not robust and we decided to exclude it. A reason for the lack of robustness, and also a reason not to include output tariffs in the regressions, is that causality is not clear: (1) the share of GDP of industry i could be high because the industry is protected –in which case the sign of the coefficient would be positive; or (2) it could be protected because is a small industry in terms of the share of GDP –in which case the sign of the coefficient would be negative- and the government wants to promote it.

intermediate goods used in the production of final goods in that industry. For each country *i*, tariffs for the manufacturing sector *s* and year *t* are computed as:

$$Tariff_{sit} = \sum_{z} \alpha_{s,z}\tau_{i,z,t}$$

where $\alpha_{s,z}$ is the share of input *z* in the production of the final output of sector s in the United States. The intuition for this index is simple: when the index is high, the goods that industry *s* uses as main inputs are heavily taxed, thereby increasing production costs and hurting competitiveness in industry *s*. This measure can identify which downstream industries are more affected by the structure of tariffs (not just by the average tariff level). For example, if the production of clothing requires textiles as inputs but production of electronic does not, then tariffs on textiles increase the cost of producing clothing, reducing competitiveness and value added of this industry, but have no effect on the relative cost and competitiveness of the electronic industry. Since higher tariffs on intermediate inputs increase the cost of producing goods in sector *s* reducing competitiveness and the value added of the industry, the coefficient β_3 should be negative.

14. The regression also includes fixed effects for country Θ_i and industry-year Θ_{st}. The country fixed effects capture unobserved country-specific characteristics. The industry-year fixed effects capture unobserved industry characteristics such as how tradable goods are (*e.g.* the fact that some industries produce goods that are more costly to transport than others) or changes in relative prices among industries that are common in all countries, and time effects that are common to all countries.

2.2 Data

15. We compiled a pooled cross-country cross-industry and time-series data panel covering 9 emerging and 26 developed countries over the period 1995–2008 (see Table A1 in the appendix for the list of countries). The countries included in the panel cover more than 70% of world GDP. The panel is unbalanced, with some countries having more observations than others. Tables A1 and A2 in the appendix provide summary statistics of the variables for the full sample. Table A3 in the appendix presents a matrix of correlations among variables in the sample. Data on value added by industry and factor endowments intensities are from the World Input-Output Database (WIOD).[7] The data distinguishes domestic value added and use of capital and human capital in 26 industries. Data for other explanatory variables are drawn from the World Bank's World Development Indicators, Barro and Lee (2010) and OECD.

16. The dependent variable is a simple specialisation index. Following Harrigan (1995 and 1997) and Redding (2002), we define specialisation as the ratio of industry output over national GDP. Specifically:

$$IndShare_{ist} = \frac{ValueAdded_{ist}}{GDP_{it}}$$

where $IndShare_{ist}$ denotes the value added share of industry *s* in country *i*'s GDP in period *t* (both measured in current prices in local currency units).

17. We consider three sets of explanatory variables: (1) measures of factor endowments, including capital per worker and the share of high-skill and low-skill workers in total population, (2) variables that proxy for the level of financial development and the aggregate level of research and development (R&D) done in each country, and (3) measures of product and labour market regulation, tax structure and tariff structure (see Table A1 in the appendix for summary statistics).

7 See Timmer et al. (2012) for details on how the database is constructed.

18. Data on levels of education come from Barro and Lee (2010). High-skilled labour is approximated by the share of the population that has attended at least some tertiary education. Low-skilled labour is the share of the population that has completed, at most, primary education. Medium-skilled labour is the share of the population that has completed or has some secondary education but has never attended tertiary education. Financial development is measured by the log of the ratio of private domestic credit supplied by private institutions to GDP, and aggregate investment in R&D is spending in R&D as percentage of GDP (both variables are from WDI). Labour market regulation is proxied by the OECD indicator of employment protection legislation (EPL) and regulation in product markets by the OECD indicator of anticompetitive regulation in energy, transport and communications (ETCR). Data on labour taxes also come from the OECD databases. We construct the tariff variable using (i) the Most Favourite Nation (MFN) applied tariffs by each of the 37 countries covered in the sample from the WITS/TRAINS/WTO database for the period 1995-2008 and (ii) the input-output tables for the United States sourced from WIOD.

19. Following a standard practice, the industry characteristics are based on data for the US economy (see Table A2 in the appendix for a list of industries used and the respective intensities for each variable) under the assumption that the US economy is the closest to the technological frontier. Although industry characteristics, such as factor intensities, may in principle differ across countries, the empirical strategy would not be invalidated as long as the relative ranking of the industries along each characteristic is similar across countries.[8]

3. Empirical results

20. The main results of the paper are reported in Tables 1 to 3. Table 1 focuses on the effects of factor endowments (capital per worker, high-skill and low-skill workers). Table 2 adds to the regression the proxies for financial development, spending on R&D and tariffs; and Table 3 incorporates the proxies for product and labour market regulation and tax structure, which are only available for a smaller sample of countries.

3.1 Factor endowments

21. The results in Table 1 demonstrate the relevance of Heckscher-Ohlin forces for the cross-country pattern of industrial specialisation. When we interact country measures of endowments per worker with industry measures of factor intensity, the following results emerge:

a) *Capital intensive industries thrive in countries where capital is relatively abundant*. Capital endowment is measured as the interaction between the country level measure of the capital-labour ratio and the industry intensity in the use of capital. These results suggest that, all else equal, countries with a relatively large capital endowment tend to have a higher share of GDP in industries intensive in the use of capital in production than countries with a relatively lower capital endowment.

b) *Countries with high human capital tend to specialise in industries requiring high skills*. The country-level measures of human capital (shares of high and low skilled labour) are introduced separately in columns 2 and 3, and then together in column 4. Both measures are interacted with

8 US factor intensities come from WIOD and are defined as the share of each factor in the industries' total purchase (use) of primary factors of production. US industry turnover and job turnover rates come from Bartelsman et al. (2008). US industry dependence on external finance comes from Rajan and Zingales (1998). US R&D intensity in each industry comes from Criscuolo and Menon (2013). Finally, US industry relative profitability comes from Arnold et al. (2011).

the intensity with which each industry employs low and high skill workers. The results in Table 1 confirm the relevance of human capital advantage in specialisation patterns: industries intensive in low skill workers take up a larger share of GDP in countries with relatively large endowments of low-skill workers; higher human capital is associated with a higher share of value added of industries intensive in the use of high-skilled workers. Results for both physical and human capital provide support to the predictions of traditional (Hecksher-Ohlin) trade theory.

Table 1. Determinants of industrial specialisation: Factor endowments

Dependent variable: Industry value added as % of GDP

Variables	(1)	(2)	(3)	(4)
Factor Endowments:				
Stock of capital per worker * Intensity of capital	0.1776***	0.1713***	0.1705***	0.1683***
	(21.106)	(20.358)	(20.068)	(19.839)
Share of low skill workers* Intensity of low-skill labour		0.0888***		0.0550***
		(13.958)		(7.477)
Share of high skill workers * Intensity of high-skill labour			0.1096***	0.0838***
			(9.655)	(6.580)
Constant	2.4352***	2.1162***	1.4933***	1.5175***
	(27.690)	(24.555)	(12.288)	(12.473)
Country fixed effects	Yes	Yes	Yes	Yes
Industry-year fixed effects	Yes	Yes	Yes	Yes
Observations	16,558	16,558	16,558	16,558
R-squared	0.750	0.752	0.753	0.753

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

3.2 Financial development, R&D investment and trade policy

22. Table 2 introduces, one by one, the variables that proxy for the level of financial development, investment in research and development (R&D) and trade policy. The results provide broad support to the hypothesis that international differences in policies and institutions are associated with different patterns of specialisation across countries.

23. Column 1 introduces the interaction between country-level financial development and industry-level dependence on external financing (following the methodology of Rajan and Zingales, 1998). With a positive and highly significant coefficient on the interaction term, the results suggest that industries that depend more on external funding represent a higher share of GDP in countries with broader access to credit. A possible explanation is that the financial sector facilitates channelling of savings to the private sector and helps overcome liquidity constraints, thereby enabling the exploitation of economies of scale (*e.g.* Beck, 2002). Moreover, Rajan and Zingales (1998) emphasized that resource reallocation may be differentially affected by industry characteristics: industries that require substantial upfront external financing (relative to generated cash flow) will be less likely to grow in the presence of capital market imperfections than other industries. Thus, differences in the degree of financial development affect comparative advantage and specialisation towards industries that depend more on external financing.

24. Column 2 introduces the interaction between the country-level total spending on R&D and a measure of industry propensity to innovate of the industry. When this variable is introduced in the

regression, the coefficient for high-skilled labour decreases considerably (though remaining strongly significant) suggesting there are complementarities between high skills and R&D investment. The coefficient for the interaction using R&D spending is positive and significant in all specifications, suggesting that higher spending in R&D is associated with specialisation in naturally innovative industries. To our knowledge, this is the first study to show that aggregate spending on R&D affects industrial specialisation. Past studies had emphasized that the production technology was an important determinant of production specialisation (*e.g.* Harrigan, 1997). More recently, Bournakis *et al*. (2011) found that, although off-shoring tends to have a negative effect on the value added share of industries such as electrical equipment and business services, the negative effect is compensated by increasing R&D spending. However, the focus in Bournakis *et al*. (2011) is different from the one in this paper.

25. Finally, the last column of table 2 reports results for tariffs. The results show that high tariffs are associated with a lower share in GDP of industries that use relatively more intensively the protected intermediate goods in production. The intuition is straightforward: higher tariffs on intermediate inputs increase the cost of production, reducing competitiveness in international markets and, therefore, the potential for industry growth. This result is consistent with studies showing that high tariffs reduce productivity and competitiveness of industries that use relatively more intensively the protected intermediate goods in production (*e.g.* Bas *et al*., 2013 and Johansson *et al*., 2013), but, as far as we know, this is the first study to show that tariffs have a significant negative effect on the share of GDP of downstream industries.

Table 2. Determinants of industrial specialisation: Factor endowments and policies

Dependent variable: Industry value added as % of GDP

Dependent variable: Industry Value Added as % of GDP	(1)	(2)	(3)
Factor endowments:			
*Stock of capital per worker * intensity of capital*	0.1552***	0.1593***	0.1612***
	(18.515)	(17.497)	(16.336)
Share of low skill workers intensity of Low Skill*	0.0572***	0.0569***	0.0657***
	(7.791)	(6.640)	(6.811)
*Share of high skill workers * Intensity of High Skill*	0.0665***	0.0399***	0.0392**
	(5.325)	(2.809)	(2.550)
Policies and institutions:			
*Financial develpopment * dependance on external finance*	0.1638***	0.1931***	0.1885***
	(9.933)	(10.432)	(9.634)
*R&D expenditure * Intensity of R&D*		1.2994***	0.9972***
		(5.143)	(3.996)
Tariffs on intermediate inputs			-0.0099**
(weighted by share of intermediate in production)			(-1.997)
Constant	1.2228***	1.1424***	1.2657***
	(9.972)	(8.011)	(8.284)
Country, industry and year fixed effects	Yes	Yes	Yes
Observations	16,316	12,402	10,891
R-squared	0.757	0.753	0.752

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

3.3 Product and labour market regulation and tax structure

26. Table 3 reports results for policies in product and labour market regulation and taxation.[9] As data for some of these policies is only available for a smaller sample of countries, results in Table 3 are not comparable with Table 2.

27. Column 1 in Table 3 repeats, for comparison purposes, the last regression of table 2. Column 2 then shows that the coefficient on the interaction between the proxy for labour regulation and job turnover is negative and significant. Thus, stricter EPL is associated with a lower share in GDP of industries with higher job turnover. This is consistent with earlier findings by Cunat and Melitz (2012) highlighting the link between volatility, labour market flexibility, and industrial specialisation in a set-up where differences in labour market regulations affect how firms can adjust to shocks. One explanation is that institutional differences interact with sector specific volatility to affect comparative advantage. Their model predicts that, all else equal, countries with more flexible labour markets tend to specialise in industries with higher volatility, a prediction that is supported also by previous empirical evidence (*e.g.* Chor 2010; Kowalski 2011).

28. Column 3 introduces the interaction between the proxy for *Entry Barriers* and a measure of firm turnover. The coefficient for this variable is negative and significant, suggesting that industries with relatively higher turnover produce a lower share of GDP in countries with stricter regulation (although not when all the variables are included together in the regression). This is somewhat consistent with previous studies finding that stringent regulations can disproportionately reduce the efficiency of industries with naturally higher reallocation needs, as measured by firm turnover (*e.g.* Andrews and Cingano, 2012; Arnold *et al.,* 2011).

29. Finally, columns 4 look at the effect of labour taxes on industrial specialisation. The coefficient for the interaction between the labour tax wedge and the intensity of labour in production is also negative and significant, suggesting that countries with higher labour taxes tend to specialise in industries that are less labour intensive. Indeed, high average labour taxes add to firms' cost of labour, especially when the tax burden cannot be shifted on to lower net wages (*e.g.* Nickell *et al.,* 2003; Bassanini and Duval, 2006; Murtin *et al.,* 2013), and more so for labour intensive firms or industries.

9. The role of labour market policies has been previously studied by Cunat and Melitz, (2012), Chor (2010) and Kowalski (2011), using a different measure of labour regulation.

Table 3. Determinants of industrial specialisation: Regulation and Tax Structure

Dependent variable: Industry Value Added as % of GDP	(1)	(2)	(3)	(4)
Factor Endowments:				
*Stock of capital per worker * intensity of capital*	0.1612***	0.1671***	0.1278***	0.1231***
	(16.336)	(8.029)	(5.123)	(4.801)
Share of low skill workers intensity of low skill*	0.0657***	0.0562***	0.0578***	0.0567***
	(6.811)	(4.886)	(4.423)	(3.928)
*Share of high skill workers * intensity of high skill*	0.0392**	0.1301***	0.1439***	0.1519***
	(2.550)	(7.978)	(8.543)	(8.384)
Policies and institutions:				
*Financial development * dependence on external finance*	0.1885***	0.1196***	0.0974***	0.1046***
	(9.634)	(5.409)	(4.073)	(4.283)
*R&D expenditure * intensity of R&D*	0.9972***	1.1069***	1.1733***	1.1984***
	(3.996)	(4.094)	(3.920)	(3.882)
Trade policy:				
Tariffs on intermediate inputs	-0.0099**	-0.0114**	-0.0089**	-0.0096**
(weighted by share of intermediate in production)	(-1.997)	(-2.353)	(-1.928)	(-1.952)
OECD regulatory variables:				
*Strictness of employment protection * intensity of job turnover*		-0.0235**	-0.0220*	-0.0293**
		(-2.164)	(-1.870)	(-2.007)
*Entry barries * intensity of industry turnover*			-0.0024*	-0.0019
			(-1.797)	(-1.252)
*Average labor tax wedge * intensity of labor*				-0.0141***
				(-2.708)
Constant	1.2657***	0.5716***	0.7253***	0.7318***
	(8.284)	(3.567)	(3.941)	(3.578)
Country, industry and year fixed effects	Yes	Yes	Yes	Yes
Observations	10,891	8,861	7,627	6,809
R-squared	0.752	0.803	0.816	0.812

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

3.4 Economic significance of the results

30. To quantify the economic significance of the link between factor endowments and policies on the one hand and specialisation on the other hand, Figure 4 reports the results of a number of experiments. The goal of the experiments is to measure how much of the cross-country differences in industry share can be explained by cross-country differences in each factor endowment and policy or institution. For example, to measure how differences in the stock of capital can explain differences in the share of GDP of industries intensive in capital, we look at the *Electricity, gas and water supply industry*, which is around the 90th percentile in the industry distribution in terms of the use of capital (see Table A2 in the appendix). Then, we compare the difference in the share of GDP of that industry between Mexico -a country with relatively low endowment of capital- and Germany –a country with relatively high stock of capital. In 2009, the actual difference was Using the estimated coefficients of Tables 2 and 3 (in each case those resulting from percentage points (see first blue bar in Figure 4). Our empirical model suggests that, because of the

difference in the stock of capital per capita between Mexico and Germany, the share of the *Electricity, gas and water supply industry* in Mexico should had been 0.25 percentage points. In other words, the lower stock of capital in Mexico relative to Germany can explain 17% of the observed difference in the *Electricity, gas and water supply* industry.

31. For the case of human capital (*i.e.* the share of high-skilled workers), we compare Spain –a country with an average level of human capital- with Japan -a country at the 75th percentile. In this case, the experiment measures to what extent the differences in human capital between Spain and Japan help explain the differences in the share of GDP of industries with high intensity of human capital (90th percentile of the distribution). The industry at the 90th percentile of dependence in human capital is *Electronic goods*. In 2009, the share of GDP of the *Electronic goods* industry was X percentage points higher in Japan than in Spain (Figure 4). The estimates suggest that the share in GDP of the *Electronics* industry should be 0.5 percentage points higher in Japan than in Spain. Thus, differences in the stock of human capital can explain 23% of the difference in the share of GDO of the *Electronic goods* industry between these countries.

32. We also use the *Electronic goods* industry to quantify the explanatory power of financial development and the Labour tax wedge because the industry is around the 90th percentile in the industry distributions of external financing dependence and intensity of labour (see Table A2). However, for each policy we compare different countries. For example, for financial development we compare Estonia –a country relatively less financially developed- and Sweden –a country with a relatively high Domestic credit over GDP. Here, the estimations suggest that differences in terms of financial development can explain 50% of the difference in the share of GDP of the *Electronic goods* industry between Sweden and Estonia (0.4 percentage points was the observed difference and 0.2 percentage poi9nts the difference predicted by the model). For labour taxes the explanatory power tends to be smaller (Figure 4). For example, cross-country differences in the average tax wedge between the Netherlands and the United States contribute to explain only 0.05 percentage points of their differences in industrial specialisation of the *Electronics goods* industry, while the actual difference in 2009 was 0.4 percentage points.

33. For R&D investment, the estimates suggest that the contribution to GDP of industries that use R&D intensively in its production (*e.g. Chemicals*), should be 0.18 percentage points higher in Korea, a countries that spends relatively more on R&D, than in Slovenia, a country that spends relatively less on R&D (Figure 4). The actual difference was 1.8 percentage points. Thus, in line with recent evidence highlighting the importance of R&D to allow resources to flow to innovative sectors (Andrews and Criscuolo, 2013), cross-country differences in R&D investment could explain as much as 10% of the differences in the share of GDP of *Chemicals and pharmaceuticals* industry.

34. Turning to employment and product market regulations, the estimates suggest that a differences in the stringency of product market regulations between United States (a country around the median of the distribution) and Netherlands (a country at the 75th percentile of the distribution) help explain around one tenth of a percentage point of the difference in the value-added share of industries with structurally high turnover, such as *Telecommunications*, while the actual difference was 0.9 percentage points in 2009. The quantitative estimates for EPL suggest that differences in labour market regulations between Italy and Denmark, can explain around two tenths of a percentage points of the differences in the value-added share of industries with structurally high job turnover (*e.g. Manufacturing nec* or *Textiles*).

35. Finally, we run an experiment to quantitatively estimate how much tariffs affect the share of value added of downstream industries, taking the case of Brazil and tariffs on electronics. The reason for choosing the electronic industry is that it relies heavily on inputs from the same industry (45% of the inputs come from the same industry). Thus, tariffs on foreign electronic goods affect domestic firms that are downstream in the same industry. Brazil was chosen because in the year 2007 it had among the highest

tariff on electronics (9.51% weighted average for the industry). The results suggest that the share of GDP of the electronic industry tends to be 0.12 percentage points lower in Brazil than in the European Union – which is at the median position of the tariff distribution (1.1%) – as a result of the differences in the level of tariffs.

36. In sum, the results on the quantitative impact of factor endowments and policies show that international differences in factor endowments and policies are important determinants of industrial specialisation. As discussed before, although in general policies tend to have lower explanatory power, international differences in policies are, in some cases, as important as factor endowments to explain international differences in industrial specialisation patterns.

4. Conclusions

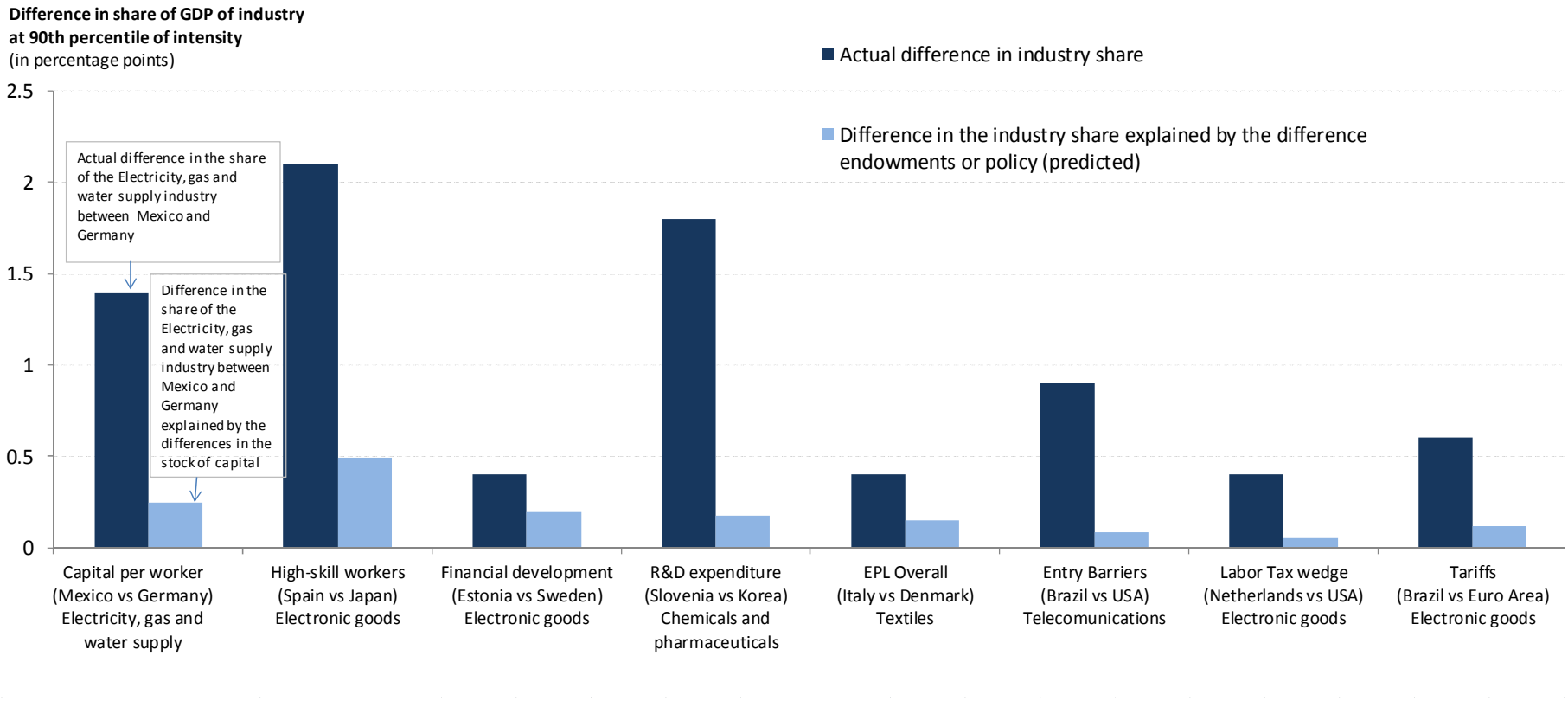
37. Since industrial specialisation is seen as a major force behind economic performance, some commentators argue that governments should use policy to affect specialisation and promote industries that are more likely to increase long run growth and decrease income inequality. This has prompted interest in better understanding the determinants of specialisation placing particular emphasis on the role of policies.

38. A growing literature is analysing how policies and institutions affect industrial specialisation. However, most recent studies focus on a measure of specialisation based on the value of gross exports. This overestimates the importance of some industries in some countries because a large share of gross exports is value added by other countries or by other industries. Moreover, most studies concentrate on manufacturing industries leaving aside services, which is at odds with the important contribution of services to GDP in most countries.

39. This paper re-examined findings by previous studies, and also extended the analysis to include policies not considered before, using a novel database that includes both manufacturing industries and services and allows to measure specialisation in terms of value added. The empirical analysis provided strong evidence that policies and institutions affect industrial specialisation, and that the effect is quantitatively similar to that of factor endowments. The results showed that cross-country differences in capital-to-labour ratios and the shares of low-skilled and high-skilled workers are among the main factors explaining cross-country differences in industrial specialisation patterns. However, cross-country differences in financial development, investment in R&D, product and labour market regulation and taxes and tariffs also can also explain why countries specialise in specific industries.

40. Further work needs to be done to establish whether these results are robust to different methodologies, samples of countries and data sources. However, the findings of this study have an important implication for future practice. Very often countries introduce specific policies that target particular industries but forget that other framework policies already in place, and some domestic institutions, are main obstacles for the targeted industry to develop. For example, many countries introduce subsidies or tariffs to support the *Electronic goods* industry -which is intensive in labour and generates relatively high value added-, while having a relatively low endowment of high-skilled workers, an underdeveloped financial market and a high labour tax wedge. This research suggests that countries should apply a comprehensive approach to design economic policies if they seek to promote specific industries, to avoid inconsistencies between the specific industrial policy and the more general policies and institutional framework already in place.

Figure 4. Difference in industry share of GDP: actual and explained (predicted) by differences in factor endowments and policies[1]



1. The blue bars show the actual difference (observed in the year 2009) for the in the industry share of the industry considered between the countries considered. The red bars show the predicted difference of the share of GDP between the same countries that is explained by the differences in the factor endowment (policy) being analyzed. The industries considered are those at the 90th percentile level of dependence on the factor endowment (policy). When comparing the country at the median with the country at the 75th percentile of the distribution of the endowment. In the case of EPL, ETRC, Corporate tax and Labour Tax Wedge, the change is from the country at the median to the country at the 25th percentile of the distribution. Tables A1 and A2 in the appendix present a lists of the countries, industries and the corresponding values for each variable. To be specific, the numbers in the figure were estimated with the following formula: $\Delta IndShare = \beta * \Delta End * \alpha_{90th}$, where ΔIndShare is the change in the industry share, β is the corresponding coefficient from tables 2 and 3, ΔEnd is the corresponding change in the endowment or policy, and α_{90th} is the intensity of the industry at the 90th percentile of the intensity distribution.

Source: OECD estimates.

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APPENDIX

Table A1. List of countries and summary statistics for the variables

Country	Capital per worker	Share of low-skill workers	Share of high-skill workers	Financial development	R&D expenditure	EPL	Entry Barriers	Labour taxes
(1) Australia	9.08	3.68	34.52	4.96	2.26	1.15	0.60	27.7
(2) Austria	9.30	24.61	12.36	4.87	2.52	1.93	1.10	48.8
(3) Belgium	9.23	21.41	23.99	4.73	1.90	2.18	1.30	55.6
(4) Brazil	7.54	48.03	7.41	4.57	1.07	n/a	2.20	n/a
(5) Canada	8.99	5.89	35.19	5.18	1.91	0.75	1.30	31.2
(6) Chile	7.89	25.24	26.92	4.45	0.33	n/a	1.40	7.0
(7) China	6.96	30.60	9.05	4.79	1.40	n/a	4.60	n/a
(8) Czech Republic	8.53	13.84	10.65	4.02	1.54	1.96	0.50	42.9
(9) Denmark	9.30	40.99	20.86	5.34	2.58	1.50	0.30	41.1
(10) Estonia	8.29	6.09	26.84	4.56	1.11	n/a	2.30	39.0
(11) Finland	9.28	32.83	24.50	4.48	3.47	2.02	1.30	43.9
(12) France	9.23	16.02	20.28	4.82	2.08	3.05	1.30	49.7
(13) Germany	9.29	10.43	17.81	4.84	2.53	2.12	0.40	51.9
(14) Greece	8.87	28.62	23.90	4.75	0.58	2.73	1.20	41.8
(15) Hungary	8.56	5.95	15.89	4.39	0.97	1.65	1.60	54.5
(16) India	6.53	53.59	5.76	4.21	0.76	n/a	2.10	n/a
(17) Indonesia	6.72	69.91	2.48	3.60	0.07	n/a	3.00	n/a
(18) Ireland	9.27	16.53	30.74	5.33	1.29	1.11	1.70	22.2
(19) Italy	9.22	23.88	10.18	4.88	1.18	1.82	1.40	46.4
(20) Japan	9.33	16.97	37.33	5.71	3.44	1.43	1.80	29.3
(21) Korea	8.72	13.06	40.14	4.69	3.21	2.03	2.90	19.7
(22) Luxembourg	9.76	28.59	15.21	5.21	1.58	n/a	1.00	36.3
(23) Mexico	8.20	31.67	16.70	3.62	0.37	3.13	3.60	15.9
(24) Netherlands	9.19	12.49	23.02	5.28	1.81	2.04	1.30	38.7
(25) New Zealand	8.83	24.29	51.49	5.03	1.17	1.47	1.00	21.1
(26) Norway	9.56	2.97	25.58	4.47	1.65	2.69	1.60	37.5
(27) Poland	8.12	21.90	15.27	4.09	0.57	1.90	1.20	38.2
(28) Portugal	8.66	54.65	10.82	5.18	1.17	3.46	1.30	37.3
(29) Russia	7.43	6.72	55.97	3.18	1.12	n/a	1.60	n/a
(30) Slovak Republic	8.24	18.81	12.57	3.99	0.46	1.34	0.90	38.4
(31) Slovenia	8.78	4.54	17.04	4.47	1.45	n/a	1.70	43.3
(32) Spain	9.00	24.80	24.06	5.37	1.27	2.98	1.10	39.0
(33) Sweden	9.28	10.65	23.64	4.98	3.40	2.24	0.50	45.3
(34) Switzerland	9.40	35.55	17.45	5.20	2.97	1.14	1.70	21.9
(35) Turkey	8.07	52.81	9.30	3.96	0.72	3.72	2.40	42.7
(36) United Kingdom	9.09	27.42	23.97	5.36	1.78	0.75	0.90	34.1
(37) United States	9.10	2.77	51.81	5.40	2.67	0.21	1.70	30.3
Median	8.20	21.90	24.06	4.56	1.45	1.82	1.60	38.7
75th percentile	9.29	30.60	37.33	4.98	3.21	1.50	1.30	30.3

Notes: Data is for the last year for which we have data. Capital per worker the year is 2008; for human capital is 2010; Financial Development is 2009 (Norway 2006); R&D 2009; EPL, Entry Barriers and Labour Taxes is 2007

Table A2. List of industries and intensities

Industry/Sector	Intensity of Capital	Intensity Low-skill workers	Intensity High-skill workers	Dependance of External Finance	R&D Intensity	Intensity of Firm Turnover	Intensity of Job Turnover	Industry Relative Profitability	Labour intensity
(1) Basic metals	0.15	0.14	0.15	0.44	0.01	14.6	35.5	0.52	0.68
(2) Construction	0.11	0.21	0.11	0.19	0.00	22.6	58.6	0.33	0.66
(3) Chemicals and chemical	0.35	0.05	0.45	6.20	0.13	14.7	30.4	1.60	0.45
(4) Coke, refined petroleum and nuclear fuel	0.63	0.07	0.32	0.78	0.05	16.2	40.1	1.42	0.23
(5) Electronic goods	0.28	0.06	0.43	1.62	0.27	23.6	37.0	0.57	0.80
(6) Electricity, gas and water supply	1.31	0.04	0.28	0.12	0.00	7.3	18.3	n/a	0.27
(7) Financial intermediation	0.30	0.01	0.45	1.60	0.00	21.5	42.2	n/a	0.53
(8) Fodd, beverages and tobacco	0.21	0.19	0.18	0.53	0.01	17.2	39.3	1.30	0.44
(9) Leather, leather and footwear	0.11	0.28	0.14	0.19	0.01	26.4	45.6	0.75	0.80
(10) Machinery nec	0.27	0.08	0.24	0.19	0.06	14.4	33.6	0.82	0.71
(11) Manufacturing nec	0.12	0.18	0.18	0.17	n/a	20.4	43.5	0.83	0.65
(12) Other non-metalic minerals	0.22	0.14	0.17	0.00	0.02	15.0	38.7	1.15	0.59
(13) Other Air transport	0.86	0.12	0.15	0.43	0.00	24.0	42.6	0.70	0.70
(14) Other Inland transport	0.30	0.12	0.15	0.43	0.00	24.0	42.6	0.70	0.63
(15) Other Water transport	1.36	0.12	0.15	0.43	0.00	24.0	42.6	0.70	0.46
(16) Telecomunications	0.66	0.02	0.28	1.67	0.00	24.0	31.3	1.19	0.50
(17) Paper and printing	0.16	0.08	0.31	0.09	0.01	17.8	36.6	1.09	0.66
(18) Real estate activities	8.97	0.06	0.38	3.35	0.00	21.5	49.3	n/a	0.05
(19) Renting of m&eq and other business activities	2.79	0.09	0.45	3.35	0.00	21.5	48.5	1.37	0.17
(20) Retail trade, except of motor vehicles	0.16	0.12	0.20	0.75	0.02	21.8	n/a	0.58	0.56
(21) Rubber and plastics	0.23	0.14	0.16	0.56	0.03	16.5	35.8	1.00	0.61
(22) Sale, maintenance and repair of motor vehicles	0.16	0.08	0.28	0.75	0.02	21.8	n/a	0.58	0.56
(23) Transport equipment	0.22	0.08	0.26	0.20	0.18	16.5	30.3	0.67	0.70
(24) Textiles and textile	0.12	0.28	0.14	0.19	0.01	26.4	45.6	0.75	0.73
(25) Wood products	0.14	0.19	0.11	0.01	0.00	20.8	43.7	0.66	0.75
(26) Wholesale trade and commission trade	0.16	0.11	0.13	0.75	0.02	21.8	n/a	0.58	0.56
10th percentile industry	0.12	0.05	0.13	0.11	0.00	14.65	30.61	0.57	0.25
90th percentile industry	1.34	0.20	0.44	2.51	0.10	24.00	47.89	1.36	0.74

Table A3. Pairwise correlations between the dependant and explanatory variables

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) Industry Share	1.00										
(2) Stock of capital per worker * intensity of capital	0.51	1.00									
(3) Share of low skill workers* intensity of Low Skill	-0.12	-0.18	1.00								
(4) Share of high skill workers * Intensity of High Skill	0.22	0.23	-0.53	1.00							
(5) Financial develpopment * dependance on external finance	0.32	0.43	-0.31	0.44	1.00						
(6) R&D expenditure * Intensity of R&D	-0.11	-0.12	-0.18	0.34	0.24	1.00					
(7) Tariffs on intermediate inputs	-0.15	-0.21	0.38	-0.24	-0.16	-0.02	1.00				
(8) Average Labor Tax wedge * intensity of labor	-0.36	-0.47	0.18	-0.41	-0.35	0.14	0.07	1.00			
(9) ETCR Overall * Intensity of Industry Turnover	0.02	0.01	0.49	-0.44	-0.05	-0.13	0.16	0.13	1.00		
(10) Strictness of Employ Regulation Overall * Intensity of Job Turnover	-0.12	-0.17	0.54	-0.39	-0.13	0.01	0.24	0.33	0.51	1.00	
(11) Combined corporate income tax rate * Industry relative profitability	-0.06	0.31	-0.04	0.20	0.45	0.03	0.01	-0.25	0.11	0.00	1.00

Table A4. Industry share of GDP by country (Year 2009)

Industry\Country	Australia	Austria	Belgium	Brazil	Bulgaria	Canada	China	Cyprus	Czech Republic	Denmark	Estonia	Finland	France	Germany	Greece	Hungary	India	Indonesia	Ireland	Italy	Japan	Korea	Latvia	Lithuania	Luxembourg	Malta	Mexico	Netherlands	Poland	Portugal	Romania	Russia	Slovak Republic	Slovenia	Spain	Sweden	Turkey	United Kingdom	United States	**Average**
(1) Agriculture	2.6	1.5	0.7	5.6	5.2	1.6	10.3	2.3	2.3	0.9	2.6	2.7	1.7	0.8	3.1	3.3	17.2	15.3	1.0	1.8	1.4	2.6	3.3	3.4	0.3	2.0	3.6	1.7	3.6	2.5	7.1	4.7	3.9	2.4	2.6	1.8	9.1	1.0	0.9	**3.6**
(2) Basic metals	2.1	2.7	2.1	2.2	3.0	2.1	5.2	0.8	3.4	1.3	1.5	2.3	1.6	2.8	1.2	1.9	2.2	0.5	0.7	2.6	2.0	4.0	1.0	0.7	2.3	0.5	1.9	1.5	2.3	1.5	2.3	2.3	3.9	3.3	2.1	2.1	1.6	1.2	1.2	**2.0**
(3) Construction	7.5	7.3	5.4	5.3	9.1	6.1	6.6	8.2	7.4	4.9	7.0	7.0	6.4	4.3	4.5	4.4	8.2	9.9	5.6	6.3	6.1	6.9	6.6	6.4	5.3	3.9	7.1	6.0	7.3	6.1	11.0	5.5	9.5	7.9	10.8	5.2	4.2	5.8	3.8	**6.6**
(4) Chemicals and chemical	0.7	1.8	2.8	2.0	1.1	1.1	3.3	0.4	1.1	1.9	0.7	1.5	1.2	2.0	0.6	2.0	1.7	2.1	9.7	1.2	1.4	2.5	0.6	1.7	0.3	1.8	1.7	1.8	1.3	0.8	1.0	1.1	0.7	3.0	1.4	2.2	1.3	1.2	1.5	**1.7**
(5) Coke, refined petroleum and nuclear fuel	0.2	0.2	0.6	1.4	1.1	0.3	0.9	0.0	0.0	-0.1	0.5	0.4	0.1	0.1	0.8	1.9	1.4	2.4	0.2	0.1	1.2	0.6	0.0	1.3	0.0	0.0	0.8	0.3	0.7	0.4	1.1	3.4	0.3	0.0	0.2	0.2	0.3	0.2	0.9	**0.6**
(6) Education	4.3	5.7	7.0	5.2	3.8	4.7	3.2	6.3	4.4	6.2	5.4	5.3	5.4	4.7	6.9	4.9	4.3	1.8	5.9	5.0	3.9	6.6	5.5	6.3	4.0	5.8	5.1	5.0	4.8	7.0	3.8	3.1	3.4	5.7	5.2	5.8	3.7	5.5	5.5	**5.0**
(7) Electronic goods	0.4	2.3	1.0	1.1	1.1	0.7	4.7	0.2	3.0	2.5	1.9	3.3	0.9	2.9	0.3	4.7	1.3	2.4	4.2	1.6	2.8	6.9	0.6	0.8	0.4	3.2	1.5	0.7	1.4	1.1	1.6	0.8	2.7	2.1	0.7	2.3	0.8	1.0	1.8	**1.9**
(8) Electricity, gas and water supply	2.3	2.8	2.2	3.1	3.7	2.2	2.7	2.0	5.7	1.9	3.9	2.7	1.6	2.9	2.6	3.4	1.6	0.8	1.6	2.3	3.3	1.8	3.6	3.9	1.2	2.1	1.2	2.3	3.7	2.8	2.4	3.2	5.5	3.2	2.5	3.3	2.6	2.1	1.9	**2.7**
(9) Financial intermediation	8.6	4.5	6.0	7.2	5.8	6.8	5.2	8.2	3.9	6.8	3.4	3.2	5.1	4.3	5.4	4.5	5.4	3.3	9.8	5.4	5.7	6.9	6.1	2.3	26.0	5.4	4.3	7.5	3.8	7.8	2.4	5.0	4.1	5.0	6.6	4.5	4.9	9.0	8.3	**6.1**
(10) Food, beverages and tobacco	1.9	2.3	2.0	2.5	2.8	2.0	3.8	2.1	2.9	2.4	2.2	1.8	1.5	1.4	3.5	2.2	1.5	7.5	4.2	1.9	2.6	1.4	2.4	4.0	0.7	1.9	5.2	2.9	3.4	1.8	6.3	2.7	1.8	1.7	2.1	1.4	3.0	1.7	1.5	**2.6**
(11) Health and social work	6.7	6.2	7.9	4.1	2.5	5.5	1.7	4.1	4.2	12.1	4.2	9.8	9.2	8.0	4.5	4.2	1.7	0.4	8.2	6.1	5.4	4.5	3.3	4.1	5.0	6.6	3.1	9.9	3.8	6.5	3.3	3.8	3.4	5.7	6.5	11.7	1.9	7.2	7.5	**5.5**
(12) Hotels and restaurants	2.0	4.9	1.7	1.9	2.3	2.2	2.1	6.0	1.9	1.5	1.5	1.6	2.4	1.7	7.2	1.6	1.4	2.8	2.2	4.0	2.8	2.4	1.4	1.4	1.5	4.4	2.3	1.8	1.2	4.7	1.9	1.0	1.4	2.3	7.5	1.5	2.7	2.8	2.7	**2.6**
(13) Leather, leather and footwear	0.0	0.1	0.0	0.3	0.2	0.0	0.5	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.1	0.2	0.3	0.0	0.5	0.0	0.1	0.0	0.0	0.0	0.0	0.2	0.0	0.1	0.5	0.4	0.1	0.2	0.2	0.1	0.0	0.2	0.0	0.0	**0.1**
(14) Machinery	0.5	2.3	1.0	1.1	1.4	0.9	3.1	0.2	2.8	1.9	0.7	2.8	1.1	3.3	0.3	1.6	1.2	0.4	0.5	2.3	1.8	2.6	0.3	0.5	0.5	0.2	0.7	1.2	1.5	0.8	1.1	1.2	1.3	2.3	1.0	2.0	1.2	0.9	0.8	**1.3**
(15) Manufacturing, Nec	0.4	1.1	0.4	0.7	0.7	0.7	0.6	0.4	1.0	0.7	0.9	0.4	0.4	0.5	0.5	0.4	0.7	0.6	0.4	0.9	0.4	0.4	0.6	1.6	0.1	1.5	0.5	1.0	1.0	0.7	1.0	0.3	0.9	0.9	0.6	0.4	0.5	0.5	0.7	**0.7**
(16) Mining	9.8	0.4	0.1	1.8	2.7	8.4	4.3	0.3	1.1	2.5	1.3	0.4	0.1	0.2	0.4	0.2	2.4	12.0	0.5	0.4	0.1	0.2	0.5	0.3	0.1	0.3	7.8	3.0	2.2	0.5	1.2	9.1	0.6	0.4	0.2	0.6	1.6	2.2	1.7	**2.1**
(17) Other community services	3.4	4.1	2.7	4.1	2.2	6.0	2.4	3.8	3.2	4.6	3.4	4.1	3.7	4.9	4.3	4.6	2.2	4.5	3.0	3.1	4.9	3.5	4.9	3.0	2.0	11.2	1.2	3.2	4.2	2.6	3.5	1.7	3.5	3.4	4.7	4.4	1.9	4.7	3.9	**3.8**
(18) Other metalic and minerals	0.5	1.1	0.8	0.7	1.4	0.5	2.2	1.0	1.3	0.5	0.8	0.6	0.5	0.6	0.5	0.8	1.0	0.8	0.5	0.8	0.5	1.1	0.5	0.5	0.5	0.6	1.0	0.5	1.2	1.1	1.3	0.8	1.1	0.8	0.9	0.4	1.1	0.4	0.3	**0.8**
(19) Other Air transport	0.5	0.2	0.2	0.3	0.3	0.4	0.2	0.5	0.2	0.2	0.1	0.4	0.4	0.3	0.5	0.0	0.1	0.4	1.0	0.1	0.3	0.5	0.6	0.1	0.8	0.6	0.2	0.1	0.1	0.4	0.2	0.3	0.0	0.2	0.4	0.2	0.4	0.5	0.4	**0.3**
(20) Other Inland transport	1.8	2.4	2.0	3.0	4.5	2.8	2.8	0.8	4.3	1.9	3.8	2.8	2.3	1.5	1.3	2.9	5.5	1.9	1.1	3.7	2.6	2.0	4.6	6.8	2.7	1.3	5.4	2.1	3.6	1.8	5.9	4.7	3.3	2.6	2.4	2.9	9.3	2.0	1.3	**3.1**
(21) Other Supporting and auxiliary transport activities; activities of travel agencies	1.4	1.6	3.1	1.4	1.3	0.8	0.9	3.2	3.2	1.4	4.0	2.2	1.7	1.8	0.8	1.9	0.5	0.5	1.1	1.4	0.7	0.7	3.4	3.8	0.7	4.2	0.9	1.6	0.8	1.6	1.6	1.9	1.3	1.8	1.7	2.0	2.0	1.5	0.9	**1.7**
(22) Other Water transport	0.1	0.0	0.3	0.2	0.5	0.1	1.0	0.6	0.0	0.8	0.5	0.5	0.2	0.4	4.1	0.0	0.2	0.4	0.2	0.2	0.5	1.1	0.1	0.4	0.0	0.3	0.1	0.3	0.1	0.1	0.1	0.1	0.0	0.3	0.1	0.3	1.0	0.3	0.1	**0.4**
(23) Post and telecomunications	2.4	1.7	2.3	2.0	4.9	2.2	2.5	2.4	2.8	2.0	2.7	2.0	2.0	1.7	2.8	3.0	1.5	3.0	2.0	2.0	2.2	2.0	2.6	2.8	4.5	2.8	2.6	2.2	2.9	3.0	2.8	2.5	2.4	2.3	2.1	1.8	2.0	2.6	2.9	**2.5**
(24) Private households employment	0.0	0.0	0.2	0.0	0.0	0.2		1.1	0.0	0.2	0.0	0.1	0.6	0.3	0.9	0.0	0.2	0.0	0.1	1.1	0.0	0.0	0.0	0.1	0.4	0.3	0.5	0.4	0.6	1.0	0.0	0.0	0.0	0.1	0.0	0.0	0.2	0.5	0.1	**0.2**
(25) Public administration	3.8	6.1	7.6	10.2	7.1	7.2	3.8	10.3	5.8	6.7	7.7	5.4	7.8	6.1	9.7	8.9	6.4	3.5	5.6	6.8	6.1	6.7	8.3	7.5	5.3	6.9	4.3	7.4	6.1	9.3	4.9	6.1	7.1	6.4	6.6	5.0	4.8	4.9	8.7	**6.6**
(26) Pulp and paper	1.2	1.3	1.1	1.2	0.8	1.7	1.1	0.7	1.3	1.0	1.2	2.9	0.8	1.2	0.8	1.0	0.4	1.1	3.0	1.0	1.4	1.2	0.9	1.0	0.5	1.4	0.9	1.4	1.4	1.2	1.1	0.6	1.2	1.4	1.2	1.9	0.8	1.4	1.7	**1.2**
(27) Real estate activities	11.6	9.5	10.1	8.4	14.6	10.0	5.5	14.3	5.4	10.7	10.8	12.3	14.6	12.9	10.9	9.0	6.0	2.6	5.4	13.9	13.0	7.7	11.2	8.4	9.8	7.3	9.5	6.7	7.2	8.1	7.5	5.2	6.5	7.9	8.7	9.6	13.6	9.0	11.9	**9.4**
(28) Renting of m&eq and other business activities	10.2	9.7	14.4	7.0	3.3	6.6	3.7	6.5	9.0	9.9	10.5	9.5	14.0	14.0	3.5	10.0	5.2	1.3	12.0	9.5	9.3	6.7	8.7	5.9	12.6	10.4	7.1	14.0	7.2	7.5	5.4	7.4	8.6	10.3	8.3	12.4	5.2	16.6	13.6	**8.9**
(29) Retail trade, except of motor vehicles and motorcycles; repair of household goods	4.2	4.6	4.0	6.7	2.7	6.0	1.5	5.6	4.5	3.5	4.5	3.6	4.1	3.8	5.7	4.7	8.8	4.2	3.4	4.2	3.6	4.8	6.5	6.9	3.4	4.2	0.6	3.3	7.7	4.5	4.2	7.1	6.4	4.7	4.8	3.7	5.1	5.2	6.0	**4.7**
(30) Rubber and plastics	0.3	0.7	0.5	0.7	0.5	0.7	1.3	0.3	1.7	0.6	0.4	0.6	0.5	0.9	0.3	1.1	0.4	0.8	0.4	0.6	0.7	1.3	0.3	0.8	0.7	0.6	0.5	0.4	1.1	0.5	0.9	0.3	1.1	1.3	0.6	0.5	0.6	0.6	0.4	**0.7**
(31) Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of fuel	2.8	1.7	1.5	1.4	1.2	0.4		1.6	1.8	1.1	1.9	1.6	1.6	1.6	2.5	1.3	0.7		1.0	1.8	1.0	0.6	1.8	2.4	1.2	2.1	0.4	1.5	3.4	3.4	0.6	1.6	1.3	2.0	1.7	1.6	2.1	2.2	0.9	**1.6**
(32) Transport equipment	0.7	1.4	0.9	1.5	0.4	1.8	2.2	0.1	3.6	0.2	0.5	0.6	1.3	3.0	0.4	2.9	1.2	3.0	0.3	0.9	2.3	4.9	0.4	0.9	0.1	1.0	2.0	0.5	1.7	0.8	2.9	0.9	2.4	1.3	1.2	1.4	0.9	1.2	1.2	**1.4**
(33) Textiles and textile	0.2	0.4	0.5	1.2	2.6	0.3	2.7	0.2	0.6	0.2	1.0	0.2	0.3	0.3	0.9	0.4	1.7	1.8	0.1	1.4	0.3	1.1	0.5	1.2	0.3	0.5	0.6	0.2	0.8	1.6	1.6	0.2	0.6	0.7	0.4	0.1	4.3	0.3	0.2	**0.8**
(34) Wood and wood work	0.4	0.9	0.2	0.3	0.4	0.8	0.8	0.5	0.8	0.3	1.8	0.7	0.2	0.3	0.1	0.3	0.4	1.4	0.2	0.3	0.1	0.1	1.9	1.2	0.1	0.1	0.2	0.2	0.7	0.7	0.9	0.3	1.3	0.6	0.2	0.6	0.2	0.2	0.1	**0.5**
(35) Wholesale trade and commission trade	4.5	6.5	6.6	4.5	4.6	5.9	7.1	5.1	5.5	6.9	6.5	4.6	4.3	4.8	8.2	5.6	5.4	6.3	5.1	4.9	7.6	3.6	6.9	7.6	6.7	4.5	15.0	7.4	7.2	5.5	6.8	11.1	8.2	5.9	3.9	6.2	4.8	3.8	5.6	**6.2**

1. Note by Turkey:

The information in this document with reference to "Cyprus" relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognises the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Turkey shall preserve its position concerning the "Cyprus issue".

2. Note by all the European Union Member States of the OECD and the European Union:

The Republic of Cyprus is recognised by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.

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