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BACKGROUND PAPER

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The Incidence of Culture, Governance and Economics on the Countries' Development through an Analysis of Coupled Networks

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Abstract

This paper introduces an innovative methodology that combines industry level information (exports, HA 4-digits) with indicators at the country level, to analyze which social capabilities are important to explain the observed patterns of structural transformation. We consider several indicators to characterize three dimensions: cultural, governance and economic, plus only one indicator (Polity) for a political dimension. Through the use of the product space, a measure of density that identifies the proximity of non-developed products to the countries' export profile, and a system of coupled networks where densities are adjusted in terms of social affinities, we find the following main results: (i) countries can be competitive in certain industries even if they do not have a high value in some of these indicators; (ii) the governance dimension is closely related on how the countries' export profiles are positioned in the product space; (iii) all of these dimensions, but not all the indicators, help explain the observed process of structural transformation and the widening of the gap between poor and rich countries.

1. Introduction.

The process of structural transformation is a key element in the mechanics of economic development and growth. The fact that the patterns of specialization vary notoriously among countries suggests that our understanding of the development process is unnecessarily handicapped when looking at the world through aggregated data. In particular, a disaggregated analysis can be very fruitful when studying the cultural, governance and economic underpinnings that a country exhibits when moving forward on its economic development path. Economic development takes place when industries become competitive once certain productive capabilities appear locally. In the economic and political literature, it is commonly stated that a set of social pillars have to be built if countries are to be embedded in a prosperous development path [Fukuyama, 2014, Schwab, 2014, Besley and Persson, 2011]. However, it is still not very clear how each of these pillars exerts an influence on the transformation of the countries' productive structures.

In order to improve our knowledge on the type of social pillars that foster economic activity in specific industries, it is important to analyze how countries 'navigate' through a product (or industry) space from different initial conditions. Economies evolve by means of "creative destruction", where new products are added into the countries' productive structure while others are removed [Klimek, *et al*, 2012]. For this to be possible, productive capabilities have to be transferred between industries through a process of social learning and local interactions that may involve a large diversity of actors: workers, entrepreneurs, managers, firms, public agencies and political parties.

A productive capability is a form of tacit knowledge that is essential for pursuing economic activities. This knowledge is not embedded in physical objects and cannot be obtained through formal scholarship, imports, foreign investments or patent acquisitions. Instead, it is acquired through a slow

process of learning-by-doing where individuals, firms and organizations interact in a local context. Productive capabilities evolve to fulfill specific economic tasks and their scope is limited to a narrow base of industries; for instances, labor skills, regulation for specific industries (e.g., phytosanitary certifications), refrigerated warehouses and trucks. While social capabilities evolve to fulfill different social functions but affect the economic arena in a wide spectrum of industries by smoothing the transfer and use productive capabilities. Examples of these are rule of law, government efficacy, trust, sense of duty, sanitation facilities, and telecommunication infrastructure.

For a good understanding of the development dynamics, it is important to identify two key elements: the level of the social capabilities associated with competitive production of an industry and the social similarity between any pair of industries. In other words, with an imputed value for a specific social capability in each industry, it is feasible to calculate a proximity measure between any pair of industries. Then, it is possible, to estimate whether or not a social affinity in such capability can play a supporting role in shifting productive capabilities from one industry to another. In this paper, we classify social capabilities into three main dimensions: cultural, governance, and economic; each of them characterized with different features.[1] Therefore, several proximity metrics are built to identify parallel mechanisms that make structural transformation more likely.

In this paper, we implement an innovative methodology to estimate the extent in which social capabilities drive up the impact of productive capabilities on economic development. In other words, we identify which of type of social affinity exert an influence on the creation of new and competitive industries through the transfer of productive capabilities. Furthermore, we show that certain social capabilities contribute to reinforce a process of local convergence, where the countries' development

[1] In fact, we also have a political dimension; however, due to data limitations, we only use one indicator for this dimension in the analysis.

paths diverge as a consequence of their initial productive structure and the social similarity of non-developed industries with respect to such structure. That is, we infer that a social affinity in a specific capability is a good conduit for transferring productive capabilities through local interactions when it helps to predict which paths countries will follow.

For instance, R&D intensive industries do not often emerge in countries where property rights are badly enforced. In contrast, traditional industries, such as coal mining, are frequently undertaken when the natural resource is available despite of the fact that rule of law is lacking. Consequently, a poorly functioning rule of law is not a stringent requirement for all type of economic activities. Perhaps, some social norms or informal devices evolved to substitute legal procedures in an economy so that the country's mining firms could operate competitively in international markets. Moreover, with these informal enforcement rules in place, the needed productive capabilities may be also adopted in other industries that are not currently developed in so far as they share the capability of operating efficiently without a sophisticated legal framework (*i.e.,* when there is a form of social affinity).

Nonetheless, not all social affinities are good conduits for the mobilization of productive capabilities in a national economy. For example, when a country has a weak and an ineffective State, it will be difficult for the private and social sectors to come up with alternative means for transferring a good practice from an established industry to a potential one. When this scenario holds, the calculated proximities for the corresponding social capability are irrelevant to foresee which industries are likely to appear. That being said, our methodology does not establish a priori judgments, such as expert advice, for specifying the intensity of a particular form of social capability in a given industry. Instead, we employ an outcome based approach to estimate the degree of these intensities and to infer how any pair of industries is connected in terms of a specific social capability.

With respect to the cultural dimension of development, economists introduced these elusive variables in their models more forcefully in the last two decades.[2] Under this perspective, culture is understood as a shared system of norms, beliefs, cognitive mechanisms and ideologies. Accordingly, it cannot be thought as a rigid set of parameters, but as a flexible set of elements that coevolves with changes in the social, political and economic arenas. Consequently, with the expression 'cultural underpinnings of economic development' we do not intend to say that some countries are culturally determined to be locked in a specific stage of development. Although, culture is relatively fixed in a medium term perspective (*i.e.,* less than a decade), anecdotic evidence and data show that culture is in a continuous state of flux [Inglehart and Welzel, 2005]. Therefore, it is possible that, in a specific point of time, specific industries or sectors of the economy are more developed in one country over another for reasons that have to do with entrepreneurial, corporate and working cultures. For instance, a culture that makes individuals more prone to take risks or to solve collective action problems through 'trust with outsiders' has, presumably, an inclination to invest in large scale projects and capital intensive industries.

We use a complex network methodology to estimate how the countries' patterns of specialization evolve in different spans of time (*e.g*., 5, 10 or 15 years) with the support of different social capabilities. The seminal work of Hidalgo, Hausmann and their colleagues (2007, 2009, 2013) on economic development through disaggregated trade data and network theory has been very illustrative. In particular, these authors build a product space where the export profile (or productive structure) of any

[2] The revival of the cultural perspective on development is due to a large extent on the conceptualization and measurement of social capital (*e.g.,* Knack and Keefer, 1997, Tabellini, 2010) and the increase in the number of countries included in recent waves of the World Value Survey (e.g. Petrakis, 2014). Recently, the literature on experimental and behavioral games has also shown that individuals' culture has an impact on decision-making (*e.g.,* Beugelsdijk and Maseland, 2011). Likewise, at the theoretical level the influence of social norms and beliefs on behavior is thoroughly explained with different conduits: preferences, cognitive mechanisms and social coordination (*e.g.,* Basu, 2010).

country can be positioned in a collection of products represented by nodes.[3] With their model, these researchers predict specific paths of structural transformation depending on initial conditions. Moreover, they implement a validation scheme for the navigation process and the local development of productive capabilities. For this scheme, these authors construct a density variable to measure how close any unoccupied node is to the country's export profile in the underlying product space and, thus, estimate a probability for the appearance of new competitive industries. In this paper, we use a variant of this metric and, through the use of a logit regression model, analyze the relevance of social affinities in different capabilities for fostering new industries.

2. Methodology.

We use a four-step methodology in this article. In a first step of this methodology, we attribute several indicators of social capabilities at the industry level. These imputed values indicate the intensity of the corresponding indicator in each of the nodes of the product space. In a second step, we build a set of coupled networks with the different indicators of the four dimensions. This enables us to construct an 'autonomy network', a 'rule of law network', an 'inequality network', and so on and so forth. In a third step, we employ these networks to calculate density variables that measure how connected an unoccupied node is with currently occupied nodes in terms of specific cultural, governance and economic indicators. We then use these density variables as explanatory factors in a logit regression on the likelihood to transit from non-production to production (*i.e.*, industry appearances). We proceed to present each of the four steps in detail.

[3]All along this paper, we use different terms to convey the same mining: (i) product, industry or node; (iii) competitive industry, developed industry or occupied node. The latter terms in each category read better when we are referring to networks.

2.a. Step 1: Attributing different forms of social capabilities at the product level.

An imputing procedure is required to determine how much competitive production in an industry tends to be related to a specific social capability. We use a slight variant of a simple statistical procedure called 'synthetic control method' [Abadie *et al*, 2010].[4] With this method, it is possible to associate the value of a certain indicator, say voice and accountability, to a product when it was originally formulated at the country level. The idea behind the method is simple as the imputed value will be higher or lower depending on the average level of the aggregate indicators for countries exporting competitively such a product. For instance, as indicated in Hartmann *et al* (2015), the imputed value of income inequality for copper is higher than for paper making machinery parts, because countries exporting copper have an average Gini of 0.48 whereas exporters of paper making machine parts have an average Gini of 0.33.

When attributing a social capability value to each product, the formula employs only those countries with a revealed comparative advantage (*RCA*) above one.[5] Then, we add and weight the normalized social capability indicator of each of these countries by its *RCA* value. That is, the imputed value for the social capability *k* in the industry *p* is given by the following expression:

$$IVI_{kp} = \frac{\sum_{c=1}^{C} \alpha_{cp}\, RCA_{cp}\, I_{ck}}{\sum_{c=1}^{C} \alpha_{cp}\, RCA_{cp}} \qquad ....(1)$$

where

$$RCA_{c,p} = \frac{x(c,p)}{\sum_p x(c,p)} \Bigg/ \frac{\sum_c x(c,p)}{\sum_{c,p} x(c,p)} \qquad \ldots(2)$$

[4] This procedure was already used in the context of the product space by Hartmann *et al* (2015) to show that the productive structure of a country, which is represented by the occupied nodes of its export profile, constraints the evolution of its income inequality.

[5] *RCA* is the ratio between the share of the export in the export profile of the country and its share in total world trade.

and $\alpha_{ck} = 1\ if\ RCA_{ck} > 1, or\ 0\ otherwise$; c= 1,....148 identifies countries, p = 1,...,1241 refers to products and k =1,....K enumerates a social capability indicator; I_{ck} is the value of the indicator for social capability k in country c; $x(c,p)$ is the value of good p exported by country c. In order to obtain an imputed weighted average with the same units than the indicators, we normalize the numerator with the sum of the *RCA* values observed in competitive nodes. For simplicity, we drop the time index t in the above expression; however, we calculate an average IVI_{kp} for all the three year-periods used in the sample (1996/1998, 2001/2003, 2006/2008, 2011/2013).[6]

Readers should be aware that before computing the IVIs, we normalized the original country indicators for social capabilities $\tilde{I}_{ck}$ in two steps. First, we rescaled these variables to the interval of zero to one using equation (3).[7]

$$I_{ck} = \frac{\tilde{I}_{ck} - \min_c(\tilde{I}_{ck})}{\max_c(\tilde{I}_{ck}) - \mathrm{mi}\ \ _c(\tilde{I}_{ck})} \qquad \ldots(3)$$

The goal of this transformation is first to have comparable values across indicators and second to avoid that the scale of the variable influences the weight we give to each indicator in the other steps of the methodology. Then, we define all indicators I_{ck} such that they have a positive correlation with the GDP per capita. The purpose of this second transformation is simply to ensure that higher values are generally associated with better economic outcomes. With the normalized variables we calculated imputed value indicators (or *IVIs*) for each industry and social capability

2.b. Step 2: The topology in a system of coupled networks.

[6] The idea behind averaging the values of RCA_{cp} and I_{kp} for each period is to avoid noisy information that comes from fluctuating export data. Accordingly, a product p is said to be produced competitively by country c only when its 3-year RCA average ≥ 1.

[7] In a few cases of highly skewed distributions, we use the percentile 1 or 99 instead of the minimum and the maximum, respectively. This allows us to avoiding collapsed distributions with little useful information. Then we set observations above P99 and below P01 to 1 and 0 respectively.

To build the coupled networks based on the social proximity of different products we borrow from the methodology used in Hidalgo *et al* (2009). They use the probability that two products are exported in tandem by a large group of countries as a proxy for the degree of proximity, because it reflects that co-exported products make use of similar productive knowledge. By computing these proximity measures for all pairs of product that are traded in international markets, we can then build a network where products are connected through undirected weighted links, which are directly obtained from the estimated proximities. Hidalgo *et al* (2009) define the proximity measure $\varphi_{p,p'}$ between products p and p' with the following expressions:

$$\varphi_{p,p'} = min\{P(\alpha_p|\alpha_{p'}), P(\alpha_{p'}|\alpha_p)\} \qquad \ldots(4)$$

$$\alpha_{c,p} = \begin{cases} 1 & if RCA_{c,p} > 1 \\ 0 & otherwise \end{cases} \qquad \ldots(5)$$

where $P\ (.|.)$ is a conditional probability; consequently, $RCA_{c,p} > 1$ means that a country c is competitive in producing product p, not only because its export value is high in terms of the country's total exports but also because such a ratio is large in terms of the share of international trade for that industry; [8] for that reason, the product deserves to be included when calculating the proximity measure.

With the conditional probabilities described in (4) and the binary rule in (5), Hausmann *et al* (2011) normalize the indicators of proximity as follows:

$$\varphi_{p,p'} = \frac{\sum_c \alpha_{cp}\alpha_{cp'}}{\max\left(\sum_c \alpha_{cp},\ \sum_c \alpha_{cp'}\right)} \qquad \ldots.(6)$$

In this paper, in addition to consider this original proximity of the product space between two nodes, we adjust proximities with the distance of the node's *IVIs* for each of the social capabilities

[8] Here, the word competitive should not necessarily be associated with efficient. Instead, it means that an export has been somehow capable of penetrating international markets.

indicators. While in the product space the direct proximity measure cannot isolate the relevance of the productive capabilities from their supporting social capabilities, the aim here is to obtain a set of coupled networks to reflect the multidimensional connectivity of the product space in terms of the different social capabilities that support the formation of competitive industries. For these alternative topologies, we multiply the direct proximity between nodes *i* and *j* by the following adjustment factor for the case of *IVI* of type k:

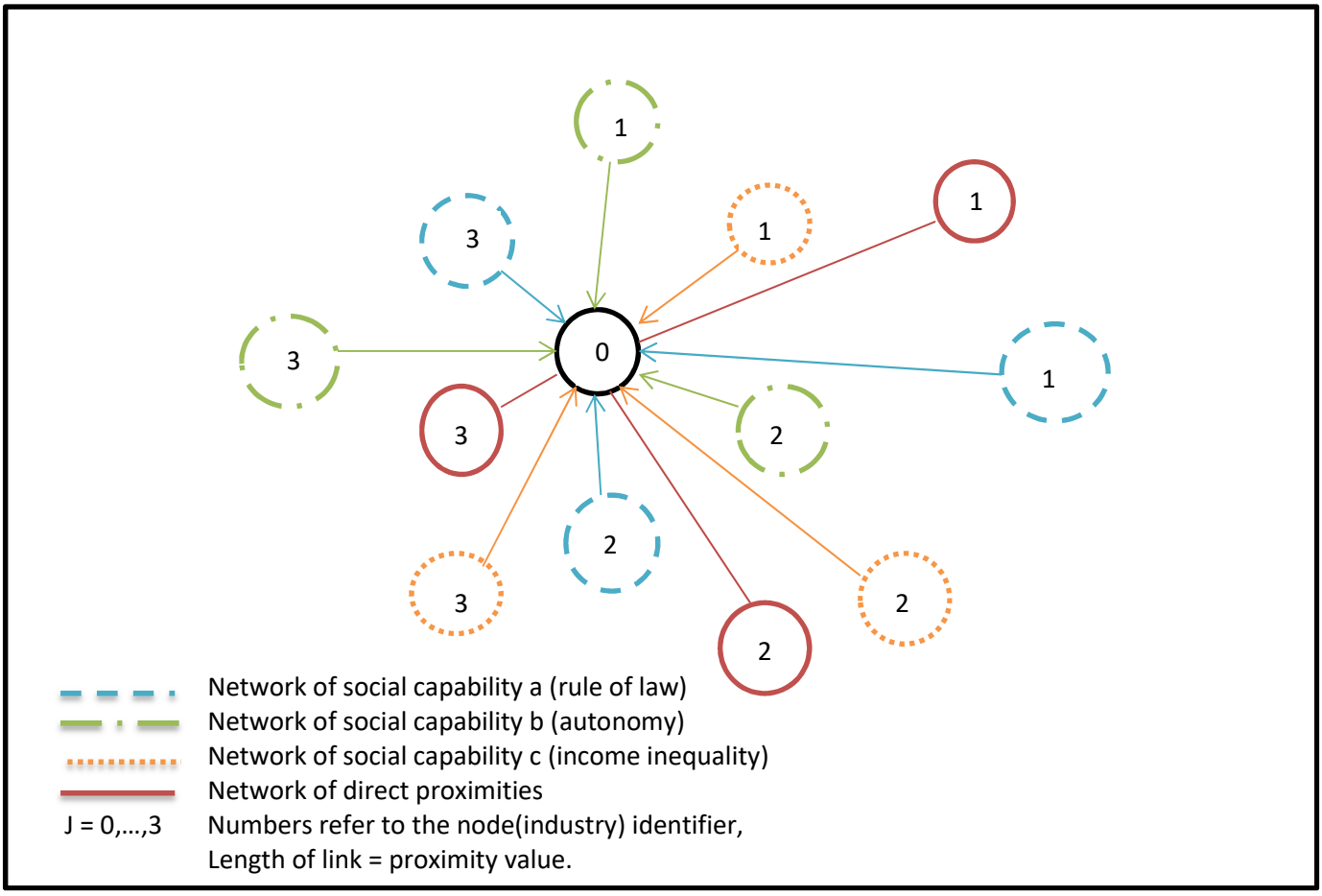
$$AF_{ij}^{k} = \left[\frac{|IVI_{k,i} - IVI_{k,j}|}{IVI_{k,j}}\right]^{-1} \qquad \ldots(7)$$

where the expression in brackets is interpreted as the relative distance between the *IVIs* that correspond to nodes *i* and *j* for the social capability *k*. Notice that this adjustment factor varies depending on which is the incoming node in the link described in the denominator and, hence, when the factor is multiplied by $\varphi_{i,j}$ it generates a directed network. To obtain a proximity measure rather than a distance measure, the adjustment factor uses the inverse of this expression. Again the time index is omitted, yet these factors are estimated for each of the 3-year periods.

Figure 1 illustrates the three strongest links of a typical node in a system of coupled networks to emphasize that the similarity between industries varies depending on the nature of the social capabilities that both nodes share. The illustration presents the original network with proximities φ_{ij} plus three other k-networks with adjusted-proximities, $\varphi_{ij}^{k} = \varphi_{ij} AF_{ij}^{k}$, each referring to different social capabilities (*e.g.,* rule of law, autonomy, income inequality). When the *IVIs* of two nodes are relatively close, irrespectively if their absolute value is high or low, we infer these two industries are similar at least with respect to this form of capability. Notice that edges with arrows describe directed networks, and that the adjusted proximities can be larger or smaller than the original proximity –represented in the figure with the link length. For instance, node 1 is relatively far from node 0 in terms of *rule of law* but relatively

close in terms of income *inequality*. Therefore, in a scenario of coupled networks, productive capabilities can 'move' between two industries with traveling distances that depend on the support received by the social capabilities involved.

Figure 1
A visualization of four coupled networks centered on a particular node



2.c. Step 3: Density variables for productive and social capabilities.

Based on the different coupled networks we can now estimate how close an unoccupied node is to the export profile of this specific country. In this way, we can tell if a product that has not yet been developed is 'far away' from the export profile of the country in terms of the cultural dimension, but

relatively 'close' in terms of the economic and governance structures for instance.[9] With this aim in mind, we calculate density variables for the different variants of capabilities with a formula that describes essentially the weighted share of occupied nodes in the neighborhood of a node that has not been developed by a country.

As in step 2, we borrow a methodology from the literature and extend it to the case of multiple social capabilities. The density variable for an unoccupied node in the original product space, where proximities are measured exclusively in terms of co-occurrence of exports, was introduced by Hausmann *et al* (2006) and the formula is the following:

$$\omega_{cpt} = \frac{\sum_{j\in\Omega_p} \varphi_{pjt}\alpha_{cjt}}{\sum_{j\in\Omega_p} \varphi_{pjt}} \qquad \ldots(8)$$

where α_{cjt} is an indicator taking the value of 1 when product j is produced competitively ($RCA_{cpt} > 1$) by country c at period t (initial condition) and zero otherwise; p is the identifier of a non-developed node (*i.e.,* outside the export profile); Ω_p is the set of the 100 closest products to node p according to their proximity:φ_{pjt} . Notice that the unit of observation for the density variable is the country-node-period, and the proximity and the *RCA* coefficients in period t are measured with 3-year averages.

For the purpose of this study, we extend the concept of the density variable to include different criteria for measuring similarity between nodes. Since the main objective of the paper is to isolate the supporting role that social capabilities play in the transmission and use of productive capabilities among industries, we adjust the direct proximity measures of the product space with the relative distance between the corresponding *IVI*s for each pair of industries. Thus, we calculate the 'adjusted density variables' in the system of coupled networks with the following expression:

[9]In this paper, productive and economic structures are not the same concepts. The former refers to the country's export profile, while the latter refers to the type of social capability that supports any production process through economic mechanisms: human capital, infrastructure, financing, etc.

$$\omega_{cpt}^{k} = \frac{\sum_{j\in\Omega_p} \varphi_{pjt} \times AF_{pj}^{k} \times \alpha_{cjt}}{\sum_{j\in\Omega_p} \varphi_{pjt} \times AF_{pj}^{k}} \quad \ldots(9)$$

Thus, we still measure the adjusted density variable for the social capability k (IVIs), ω_{cpt}^{k}, as a weighted share of occupied nodes in the neighborhood of unoccupied node *p*. Since we include the adjustment factor *AF* in both the numerator and denominator, the density variables remain bounded between 0 and 1. In other words, the density variable (ω^{IVI}) establishes how affine are the nearby nodes in the export profile of a country with respect to an underdeveloped node in terms of a particular social dimension. For instance, an unoccupied node that is 'intensive' in control of corruption can be very close to the productive structure of a particular country if the occupied nodes in the neighborhood are also, on average, 'intensive' in control of corruption.

Looking at the formula, it is evident that for the same country, period and unoccupied node there can be different density values depending on nature of the indicator of social capabilities employed to impute the nodes values. That is, an unoccupied node can be well connected with the country's export profile with respect to a cultural indicator but be very distant with regard to a governance indicator. The basic idea here is that for a country to become a competitive producer in a particular industry is not always enough to have an export profile that possess certain productive capabilities, but also a social system that presents certain cultural values and specific governance and economic structures.

According to the validation scheme of the original product space, when the density variable is relatively high it is more likely that in the near-future (period $t + \tau$) the previously non-producing node will become occupied. That is, industry *j* will become competitive since many of its closest industries are already developed and, hence, their productive capabilities are adapted to be employed in industry j. If this were the case, it can be argued that the navigation process through the product space takes place locally since most of the nodes that transit (i.e. become occupied) are in the neighborhood of the

country's export profile. A traditional practice in this literature is that an unoccupied node is defined as such when $RCA_{\mathrm{cpt}} < 0.5$; hence a transition event occurs when: $RCA_{cpt} < 0.5$ and $RCA_{cpt+\tau} > 1$, while a non-transition event happens when: $RCA_{cpt} < 0.5$ and $RCA_{cpt+\tau} < 0.5$. The remaining cases are removed from the sample since they generate an inconclusive result ($RCA_{cpt} < 0.5$ and $RCA_{cpt+\tau} \leq 1$).

2.d. Step 4: Empirical validation of the system of coupled networks by means of a logit model.

The main concern of this article consists in testing whether or not the social dimensions and, in particular, economic, cultural and governance factors exert an impact on the likelihood that a non-developed industry can be developed in the near future. With that objective in mind, the paper's hypothesis is that countries are more likely to become competitive in products that are relatively close to industries that are part of their productive structure; where closeness is defined not only in terms of productive capabilities, but also in term of social capabilities.

We test this hypothesis by means of 'density regressions' which are specified with *logit* models where the dependent variable is a binary transition capturing whether a country becomes competitive in a particular industry.[10] For that purpose, we characterize the economic, cultural and governance affinities of the unoccupied nodes with the countries' export profile with the corresponding density variables included as explanatory variables. We also include the original density variable to separate the marginal contributions of the different forms of social capabilities to the impact that the productive capabilities exert on the transition process. Beside of controlling for alternative effects, the econometric model uses additional variables: product complexity, product opportunity gain, country complexity and country fixed effects. Our logit regression can be written as:

[10] Articles using this type of density regressions are the following: Bahar et al (2014), and Hausmann et al (2014).

$$P\left(T_{t,t+\tau}^{pc} \middle| X_{cpt}, Y_{pt}, Z_{ct}, \omega_{cpt}\right) = G\left(\alpha + \lambda\omega_{cpt} + \sum_k \beta_k \omega_{cpt}^k + \gamma X_{cpt} + \theta Y_{pt} + \delta Z_{ct}\right) \quad \ldots(10)$$

$$T_{t,t+\tau}^{pc} = \begin{cases} 1 & if\ product\ p\ was\ not\ produced\ in\ t\ but\ is\ produced\ in\ t+\tau \\ 0 & if\ product\ p\ was\ not\ produced\ in\ t\ nor\ in\ t+\tau \end{cases} \quad \ldots(11)$$

where G(.) is the logistic link function; ω_{cpt} is the original density variable employed to capture the effect of productive capabilities, holding social capabilities constant; ω_{cpt}^k is the density variable adjusted with the imputed values of indicator k; X_{cpt}, Y_{pt} and Z_{ct} are control variables that change at the country-product-period level, product-period level and country-period level, respectively.

A positive estimate of some of the β's would indicate that countries are more likely to start producing in certain industries when they share the same intensities of social capabilities with their current productive structure. If the hypothesis holds, social affinities contribute to generate differentiated processes of economic development where the context matters and productive capabilities are transferred locally. For instance, if the null hypothesis: $\beta_{RofL} > 0$ is not rejected one can argue that the likelihood of transition is higher if the product has imputed values of rule of law that are similar to the imputed values in industries that are already developed. From this, we can infer that, despite that societies can find substitutes of legal enforcement and make production possible in specific industries, differentiated development paths are reinforced when the quality of the rule of law diverges among countries.

With respect to the control variables, the logit model includes the index of product complexity (*PCI*) developed in Hidalgo and Hausmann (2009), which specifies a value of sophistication for each product and period. Very complex products have a large value added and tend to be produced by a limited number of countries that are productive in a wide spectrum of industries. The expected sign of the associated parameter is negative, as it is costly to produce these goods and, hence, it is not likely to

find many transition events of this nature. Another control variable is the opportunity gain, presented in Haumann *et al* (2013), which measures how much a country can benefit from manufacturing a specific product. Such a gain will depend on the connectedness of the node in the product space and the possibility of reaching high valued products. The expected sign of the associated coefficient is positive since a larger potential for a product makes it more attractive.

Finally at the country-period level the index of economic complexity (*ECI*), developed originally in Hidalgo and Hausmann (2013) and redefined in Hausmann *et al* (2013), is employed to control for the sophistication of the country's productive structure. A country is complex in economic terms when it has a large set of productive capabilities and, hence, it is diversified and produce even in industries that are not ubiquitous, that is, not frequently observed in other economies. The expected sign for the associated coefficient is positive, since complex productive structures exhibit a large set of capabilities that make more likely the appearance of new industries.

3. Data and information sources.

In this section we describe the data used in the study. Our main dependent variable, indicating whether a country produced competitively a given product in a given period, is derived from a measure of relative competitive advantage. We calculate the RCA values using the *BACI* database from the *Centre d'Etudes Prospectives et d'Informations Internationales* (*CEPII*),[11] which classifies countries' exports through the harmonized system with 6 digits.[12] The HS 92 version of this database includes information for the years 1995-2013 in 221 countries, but for this study we reduce the sample to only 148 countries, because we establish a minimum threshold of 1,200,000 inhabitants.

[11] Available, with previous registration, at the web site: http://www.cepii.fr/CEPII/en/bdd_modele/presentation.asp?id=1

[12] In turn, BACI uses export statistics from the United Nations' COMTRADE database. BACI is constructed with a method that reconciles the declarations of the exporter and the importer. Likewise, the harmonization procedure allows increasing the number of countries for which trade data are available.

The indicators of social capabilities stem from different international organizations (see Table 1). In particular, we use the *World Development Indicators*[13] and the *World Governance Indicators*[14] databases of the World Bank for measures of the economic and the governance dimension respectively. The indicator regarding the countries' political situation comes from the *Center for Systematic Peace*[15]. We define cultural values using microdata of the *World Values Survey*[16] (*WVS*) and compute country-year averages based on the individual responses.

All these country-year indicators are then combined with the data on *RCAs* and product proximities, which allows us to compute the density variables for each social capability. We also generate the product proximity data from *BACI* database, and the same source is used for the calculation of the additional control variables measuring the complexity of products, economies and the opportunity gains of products.[17]

We can observe the model's variables for all years between 1996 and 2013.[18] However, to make a sound analysis and to avoid noisy trade measures at the annual level, we create four periods of three years each (1996/1998, 2001/2003, 2006/2008 and 2011/2013). Notice that each mid-point period is separated by 5 years, allowing us to distinguish short-, medium- and long-term effects[19].

[13] Available on the website of the World Bank: http://data.worldbank.org/data-catalog/world-development-indicators
[14] Available at: http://info.worldbank.org/governance/wgi/index.aspx#home
[15] Data available at: http://www.systemicpeace.org/inscrdata.html
[16] Data available at: http://www.worldvaluessurvey.org/wvs.jsp
[17] We are thankful with Martha Alatriste and Julio Amador who run the Stata do-files available on line for the Atlas of Economic Complexity for producing the proximities of the product space, RCAs, ECIs, PCIs and Opportunity Gains with the BACI database.
[18] We discard 1995, since for this year governance indicators are not available.
[19] We also estimated some density regressions for other definitions of periods and the results were very similar.

Table 1
List of social capability indicators grouped by dimension

Economic Dimension	**Governance Dimension**	**Cultural Dimension**
Foreign direct investment, net inflows (BoP, current US$)	Control of Corruption	Post-Materialist index (12-items)
GDP per capita (constant 2005 US$)	Government Effectiveness	Autonomy Index
GINI index (World Bank estimate)	Political Stability and Absence of Violence/Terrorism	SACSECVAL - Welzel Overall Secular Values
Health expenditure, public (% of GDP)	Regulatory Quality	DEFIANCE - Welzel defiance sub-index
Health expenditure, public (% of government expenditure)	Rule of Law	DISBELIEF - Welzel disbelief sub-index
Improved sanitation facilities, urban (% of urban population with access)	Voice and Accountability	SKEPTICISM - Welzel skepticism index
Inflation, GDP deflator (annual %)		RESEMAVAL - Welzel emancipative values
Mobile cellular subscriptions (per 100 people)		
Unemployment, total (% of total labor force) (modeled ILO estimate)		

* The Polity Index is also included as the only variable in the political dimension.

In the economic dimension, we use GDP per capita to compute an IVI capturing the level of wages in countries that competitively produce the product and,[20] thus, to infer how productive they are. The indicators of public health expenditure, improved sanitation facilities and mobile cellular subscriptions are included in the analysis to have an estimate of economic infrastructure and how it is related to developed industries in different countries. Then, foreign direct investment, GINI, inflation and unemployment are different measures of the economic environment that may influence countries with respect to their productive structure. FDI is related to the business climate for external financing, GINI to the society stress that come from a bad income distribution, inflation to the macroeconomic stability and unemployment to the relevance of wasted human capital resources.

[20] A similar IVI has already been used in the literature on economic development, the so-called PRODY [Hausmann et al, 2007].

While the governance indicators that we use in the analysis are well known in the literature and self-explanatory, some clarifications have to be done with respect to definitions of the cultural indicators. The cultural dimension is included in our analysis as people's basic values and beliefs are considered by many authors and theories to be critical for explaining the countries' economic and political performance. A detailed explanation for the cultural variables is available on the World Value Survey's web page and the on line appendix of Welzel (2013)[21]. Here we present a brief definition allowing the readers to get a good overview of the variables included in the cultural dimension.

The *Post-Materialist index* attempts to capture peoples' inclination towards self-expression and quality of life as opposed to economic and physical security.

The *Autonomy index* aims at capturing whether people emphasize on obedience and religious faith, as opposed to independence, determination and perseverance as qualities that children should learn at home.

Secular Values (or Sacred-vs.-Secular Values) is a measure of values that indicates people's dissociation from external authority (religious, patrimonial, state and norms conformity).

The *Defiance sub-index* measures the degree of individual's devoutness to their parents, respect for authority, and national pride.

The *Disbelief sub-index* calculates the relative importance given to religion and religious practice, plus individual's self-perception as being religious or not.

Skepticism sub-index is related to the confidence that individuals have on different organizations (police, armed forces and courts).

[21] The appendix can be downloaded in the following URL address:
http://www.researchgate.net/publication/269992832_Online_Appendix_to_Welzel's_CUP_monograph_Freedom_Rising

Emancipative Values (or Obedient vs. Emancipative Values) is a collection of measures attempting to quantify how strongly people claim authority over their lives for themselves; that is, people with these values emphasize freedom of choice and equality of opportunities.

4. Descriptive statistics.

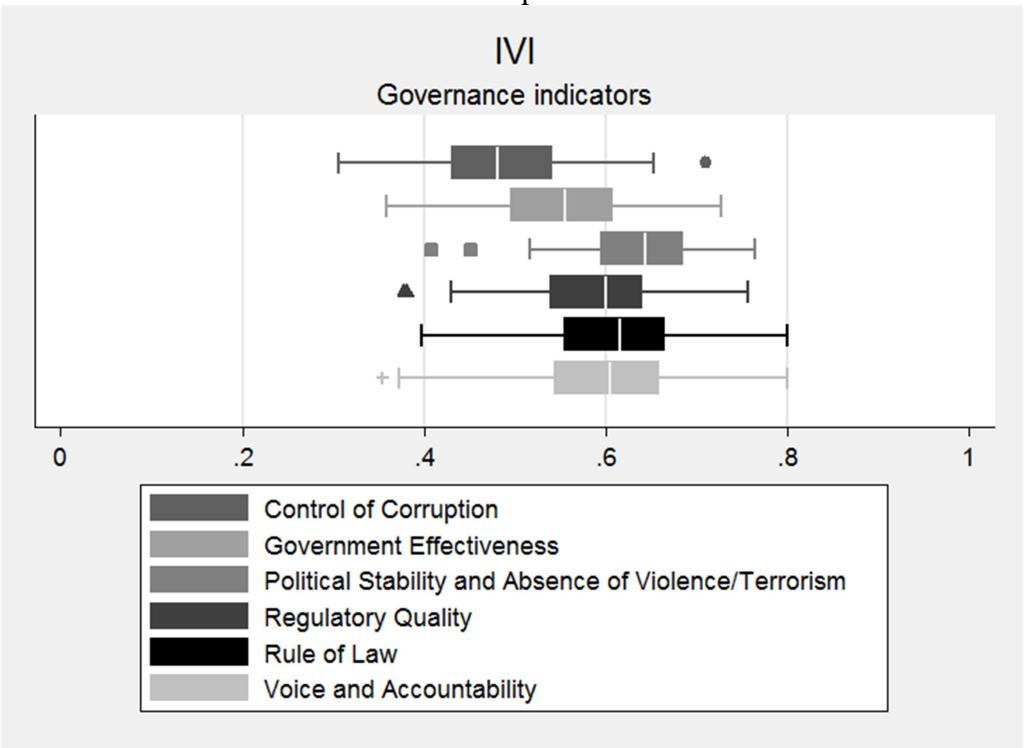
4.a. Social capabilities and product complexity.

It is interesting to take a closer look at the imputed values of social capabilities (*IVIs*) since these indicators play a central role in the model. With these values, it is possible to analyze how dispersed is the intensity of each type of capability among the nodes in the product space. For instance, the products associated with low levels of inequality, like chemical products, are located in the center of the network; whereas products associated with high inequality, like cocoa beans, are located in the periphery of the network. With all these indicators, we can produce cultural, governance and economic taxonomies for all industries considered in the product space.

The *IVI* is a measure of how the production in a given industry is attached to certain cultural, governance or economic indicator, either because these capabilities are relevant for production in specific industries or because the countries' productive structure conditions the value of these indicators. A high (low) value of IVI_k for node p means that countries producing competitively this product have on average a high (low) value in the indicator of social capability k. The average over all nodes depends on the weighted country average of the underlying indicator. Therefore, it is more interesting to look at the variation in each of the IVI's across nodes rather than their average. Looking at the distribution provides some information on how attached –and perhaps crucial- a certain social indicator is for an industry,

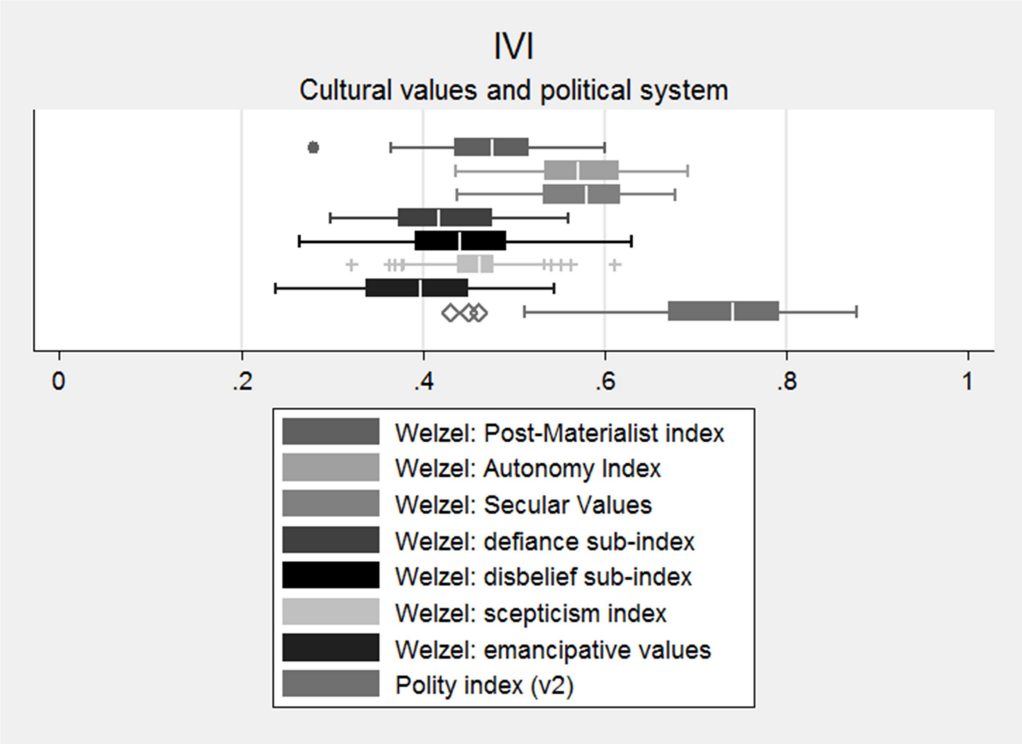
compared to other industries in the product space. The following graphs display the dispersion of the imputed values for each indicator.[22]

Graph1

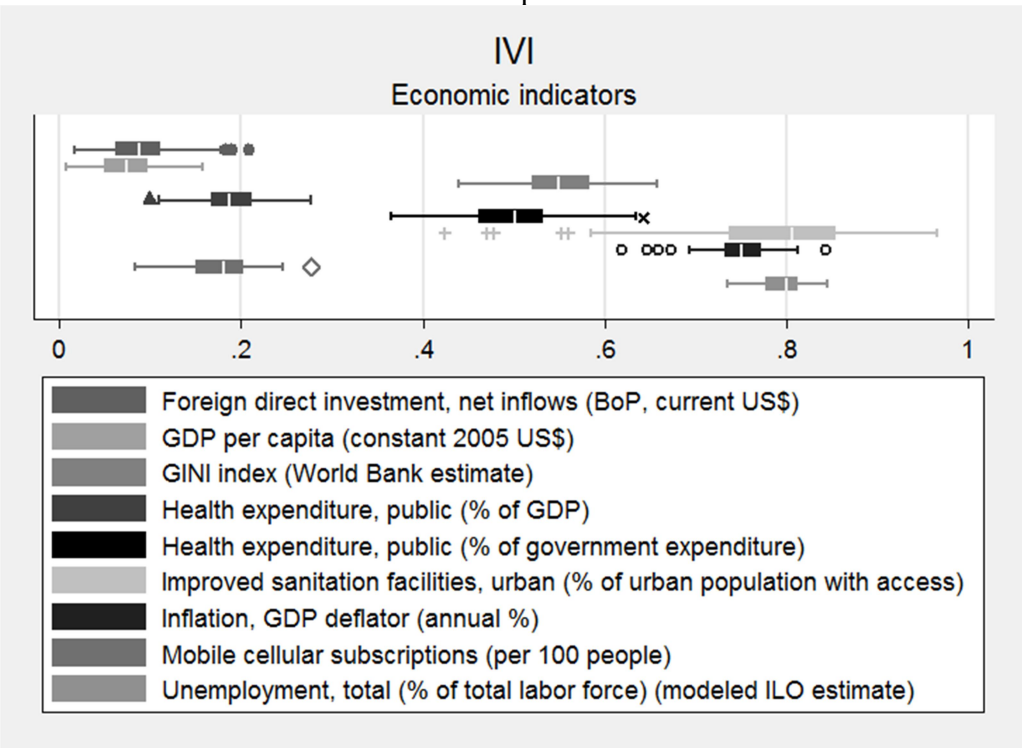


[22] In this box-and –whisker plots the white line describes the median, the filled-in boxes denote the interquartile range (i.e. between the lower and the upper quartile) and the whiskers extend to cover most of the data. Dots outside the whiskers are considered outliers.

Graph 2



Graph 3



The first thing to notice is that the magnitude of the IVIs' variance varies; for instance, 'voice and accountability' in Graph 1, 'disbelief' and 'polity' in Graph 2 and 'improved sanitation facilities' in Graph 3 are relatively large. This implies that there are some competitive industries that are common in countries with a relatively high value of certain capability, while other competitive industries are frequently observed in countries with a relatively low value of the same capability. Although not inferred directly from a descriptive analysis, a possible explanation for this finding could be that some industries rely relatively more on this capability than others. On the contrary when a variance is relatively small (e.g., unemployment), it means that the imputed values of such social capability do not differ much from one industry to another, which could suggest that the capability is not related to the variation in countries' pattern of specialization. In general, it can be observed that the degree of dispersion of social capabilities values among industries varies widely.

Moreover, in several of these indicators there are a series of outliers, suggesting that certain industries perform competitively in scenarios where the level of a certain social capability is substantially different from the average. For example, the fact that there are two outliers for the indicator of 'political stability and absence of violence' implies that, compared to other industries, these two products are on average more likely to be produced in countries with low political stability and/or high levels of violence. The products with the lowest values for this indicator include "vegetable production", "cotton" and "coffee and tea", while the highest IVIs are observed for "photographic and cinematographic goods" and "nuclear reactors". In this sense, stability does not seem to be a precondition to have competitive production in specific nodes; perhaps because firms and bureaucratic agencies have been able to overcome some of the hardships of instability with certain strategies that are helpful to particular industries.

The IVIs do not only have an important degree of dispersion, but this dispersion also follows certain patterns in the product space. Table 2 shows that with the exception of three indicators: skepticism, inflation and unemployment, there are relevant correlations between the imputed values of social capabilities and the product complexity index. In particular, all indicators of the governance dimension have a very large correlation with PCI per period and across all periods, which means that sophisticated goods tend to be produced in countries that exhibit a relatively well developed governance structure. Likewise, the same correlation indicates that production in industries with low complexity is feasible in countries with weak forms of governance.

Table 2
Correlation between IVIs and product complexity

Indicators of social capability:	**All periods**	**Period 1**	**Period 2**	**Period 3**	**Period 4**
Post-Materialist	0.255	0.352	0.024	0.393	0.295
Autonomy	0.442	0.573	0.300	0.489	0.543
Overall Secular Values	0.437	0.606	0.360	0.573	0.527
Defiance sub-index	0.562	0.655	0.451	0.648	0.648
Disbelief sub-index	0.499	0.606	0.335	0.623	0.543
Skepticism index	0.000	0.034	-0.020	-0.019	0.160
Emancipative values	0.474	0.570	0.399	0.570	0.548
Control of Corruption	0.708	0.714	0.717	0.708	0.689
Government Effectiveness	0.743	0.732	0.732	0.753	0.759
Political Stability and Absence of Violence/Terrorism	0.596	0.625	0.580	0.608	0.571
Regulatory Quality	0.715	0.699	0.711	0.722	0.734
Rule of Law	0.724	0.731	0.706	0.728	0.735
Voice and Accountability	0.654	0.665	0.645	0.648	0.658
Foreign direct investment	0.219	0.202	0.195	0.269	0.207
GDP per capita	0.713	0.756	0.718	0.720	0.717
GINI index	0.385	0.437	0.382	0.446	0.315
Health expenditure, public (% of GDP)	0.600	0.688	0.651	0.558	0.630
Health expenditure, public (% of government expenditure)	0.327	0.310	0.377	0.330	0.380
Improved sanitation facilities, urban (% of urban population with access)	0.609	0.631	0.583	0.625	0.635
Inflation	0.079	0.169	0.071	0.103	0.004
Mobile cellular subscriptions (per 100 people)	0.212	0.705	0.749	0.689	0.558
Unemployment, total (% of total labor force)	-0.019	-0.026	0.046	0.064	-0.121
Polity index (v2)	0.349	0.397	0.376	0.317	0.336

* Source: own elaboration

With regard to economic indicators, the largest correlations are observed in GDP per capita, public health expenditure as a percentage of GDP, improved sanitation facilities and mobile cellular subscriptions.[23] Since GDP per capita is introduced here as an indicator of overall productivity, this high correlation estimate implies that product complexity is, on the one hand, associated with aggregate productivity and, on the other hand, that poor (or low productive) countries can be competitive in international markets for unsophisticated products. The other three capabilities describe, somehow, indicators of economic infrastructure that when well developed are associated with complex products. Nonetheless, the data shows that countries lacking such an infrastructure are still capable of producing and exporting low complexity products. On the contrary, inflation, as a measure of economic volatility, and unemployment, as a measure of idle labor resources, do not seem to be related to the countries' productive structure; that is, the performance of these capabilities might not be linked to the production of low and high complex industries in a differentiated fashion.

Cultural capabilities, in general, also exhibit a positive correlation with product complexity. Although, their association with the countries' specialization pattern does not seem to be as important as the one observed with indicators of the governance dimension. Nevertheless, it is interesting to realize that cultural values are somehow related to the nature of the countries' productive structure. Although the descriptive analysis used here does not disentangle whether product complexity is a cause or a

[23] Given the fact that PCI does not change much between periods, it is possible to find that within periods there can be a much larger correlation than across all periods (0.212). This statistical pattern is particularly likely in a technological indicator like mobile cellular subscriptions because between periods variation is relatively large.

consequence of cultural values, we can argue that certain cultural values (*e.g.* lack of autonomy, poor emancipative values) do not prevent production in unsophisticated industries.[24]

If we analyze the data at the product level (2 digits), it becomes very clear that the intensity of the IVIs is associated with specific patterns of production (for more details see Appendix A). As an example, countries where the rule of law is strong tend to have developed industries in the production of "Works of art, collectors' pieces and antiques" (PCI=1.238) and "Photographic or cinematographic goods" (PCI=2.065), while countries with a weak rule of law are competitive in industries like "Coffee, tea, mate and spices" (PCI=-2.124) and "Articles of apparel and clothing accessories, knitted or crocheted" (PCI=-1.428).

Then, countries with a high public expenditure on health as a percentage GDP are associated with important industries in "Pharmaceutical products" (PCI=2.065) and "Nickel and articles thereof." (PCI=1.797), while countries with a low health expenditure are competitive in "Lac; gums, resins and other vegetable saps and extracts" (PCI=-2.119) and "Vegetable plaiting materials; vegetable products not elsewhere specified or included" (PCI=-2.15). Finally, in those countries where the cultural value of defiance is high there are competitive industries in "Umbrellas, sun umbrellas, walking-sticks, seat-sticks, whips, riding-crops and parts thereof" (PCI=1.649) and "Printed books, newspapers, pictures and other products of the printing industry; manuscripts, typescripts and plans" (PCI=1.565).

4.b. Statistics of transitions and nodes' IVIs.

Since economic development and structural transformation are dynamic processes, it is also important to analyze the number and nature of industries that became competitive after some period of time ($RCA_{cp,t+\tau} > 1$) for all countries included in the sample. The observations in our study refer to country-

[24] However, a causal narrative is employed when stating that specific cultural values are required for production in complex industries.

product-period combinations that were not occupied in the base year ($RCA_{cp,t} < 0.5$). We define the columns in Table 3 in terms of the time span between the starting point and the end point.[25] Long term cases refer to the analysis of a 15-year transition starting in 96/98, medium term cases describe the study of two 10-years transitions starting in 96/98 and 01/03, while short term cases present the analysis of three 5-years transitions starting in 96/98, 01/03 and 06/08.

Table 3
Frequencies of competitive transitions for different time spans

	Short term		**Medium term**		**Long term**	
	N	**%**	**N**	**%**	**N**	**%**
No transition (RCA<0.5)	397,094	96.01	258,035	93.49	125,834	90.18
Transition (RCA≥1)	11,651	2.82	11,631	4.21	6,851	4.91
Inconclusive (0.5≤RCA<1)	4,836	1.17	6,324	2.29	6,849	4.91
Total	**413,581**	**100**	**275,990**	**100**	**139,534**	**100**

* Source: own calculations.

The numbers in the previous table indicate that scenarios where industries become competitive in countries around the world are not very common. Notice that transitions are more likely when the time span between the starting and end periods increases, since short term transitions (5 years) are in the order of 2.82%, medium term (10 years) in the order of 4.21%, and long term (15 years) in the order of 4.91%.

Now, in Table 4 it is possible to get a picture of the nature of long term transitions with regard to the average values of different IVIs at the starting period. The idea here is to discover if there are patterns that differentiate nodes that transited from those that remained uncompetitive. The average imputed values for both cases are very similar in levels, although in statistical terms the p-values indicate that the null hypothesis of mean equality is rejected in all but one case: foreign direct

[25] The second last row includes those observations that did not offer a definite answer with regard to the occurrence of a transition.

investment. For instance, the imputed value for the GINI coefficient is 0.553 on average for nodes that transited, while this number is very similar (0.560) for those nodes that did not change their RCA notoriously.

Table 4
Difference in means of IVIs depending on product dynamics

	Transition			
IVIs	**No**	**Yes**	**Difference**	**p-value**
Post-Materialist	0.513	0.492	0.021	0.000
Autonomy	0.594	0.583	0.011	0.000
Overall Secular Values	0.702	0.688	0.014	0.000
Defiance	0.537	0.515	0.022	0.000
Disbelief	0.509	0.495	0.014	0.000
Skepticism index	0.385	0.384	0.001	0.304
Emancipative values	0.444	0.426	0.018	0.000
Control of Corruption	0.527	0.503	0.024	0.000
Government Effectiveness	0.583	0.561	0.022	0.000
Political Stability and Absence of Violence/Terrorism	0.669	0.656	0.012	0.000
Regulatory Quality	0.621	0.603	0.018	0.000
Rule of Law	0.644	0.624	0.021	0.000
Voice and Accountability	0.634	0.616	0.018	0.000
Foreign direct investment	0.108	0.108	0.001	0.658
GDP per capita	0.081	0.071	0.010	0.000
GINI index	0.560	0.553	0.008	0.000
Health expenditure, public (% of GDP)	0.184	0.177	0.007	0.000
Health expenditure, public (% of government expenditure)	0.472	0.462	0.009	0.000
Improved sanitation facilities, urban (% of urban population with access)	0.809	0.794	0.015	0.000
Inflation	0.732	0.728	0.004	0.003
Mobile cellular subscriptions (per 100 people)	0.026	0.023	0.003	0.000
Unemployment, total (% of total labor force)	0.787	0.782	0.005	0.000
Polity (v2) index	0.718	0.709	0.009	0.000

* Notes: the p-value refers to a simple test of the difference in means. The null hypothesis is equality of means. One observation refers to a product-country combination that was not occupied in period 1. The transition refers to long term transitions (i.e., from period 1 to period 4).
* Source**:** own calculations.

In all the IVIs with different means, there is a slightly larger average for the country-product observations that remain uncompetitive; that is, a larger value of these indicators is associated with a lower probability of transition. This result would mean that countries that exhibit a better performance of

governance, lower income inequality, or better economic infrastructure are less likely to observe transitions.[26] Nonetheless, it is important to remind the reader that in terms of magnitude the IVIs for transition cases are not very different for non-transition cases.

4.c. Statistics of density variables.

The density variable described in the methodology section is very important to determine whether an industry has potential to become competitive in a given country. The theories of capability development and path dependency suggest that when most of the node's neighbors are part of the country's export profile is more likely to observe industries in transition. This phenomenon seems to be reflected in the numbers shown in Table 5, where we present the density estimated with the topology of the original product space in the first row, and the densities for the different kinds of social capabilities in the remaining rows. The table exhibits the average values of density variables that we calculated with observations for all country-product combinations that in their starting period were not competitive.

The results are very compelling in favor of a process of local navigation since the null hypotheses of equality of means is always rejected. For all density variables, the mean for the transition case is larger than for the no transition case, either in terms of economic or statistical relevance, as can be concluded from columns three and four, respectively. These estimations also highlight the conjecture that a view of coupled networks, where productive and social capabilities are differentiated, is relevant to analyze the process of economic development. Cultural factors and governance and economic indicators seem to be good candidates to estimate the probability of transition with an econometric model.

[26] We can derive two interpretations from this fact: firstly, developed countries with abundant social capabilities do not frequently present industries that transit since most of them are already competitive; secondly, relatively high level of these capabilities are not required for low and medium income countries to find ways to develop different industries in their economies.

Table 5
Difference in means of density measures depending on product dynamics

Density measures	No transition	Transition	Difference	p-value
Product distance measure	0.0698	0.1350	-0.065	0.0000
Post-Materialist	0.0704	0.1390	-0.069	0.0000
Autonomy	0.0693	0.1380	-0.068	0.0000
Overall Secular Values	0.0704	0.1370	-0.067	0.0000
Defiance sub-index	0.0717	0.1440	-0.072	0.0000
Disbelief sub-index	0.0709	0.1380	-0.067	0.0000
Skepticism index	0.0693	0.1370	-0.067	0.0000
Emancipative values	0.0715	0.1420	-0.071	0.0000
Control of Corruption	0.0728	0.1460	-0.073	0.0000
Government Effectiveness	0.0728	0.1430	-0.070	0.0000
Political Stability and Absence of Violence/Terrorism	0.0713	0.1440	-0.072	0.0000
Regulatory Quality	0.0719	0.1460	-0.075	0.0000
Rule of Law	0.0720	0.1450	-0.073	0.0000
Voice and Accountability	0.0708	0.1430	-0.072	0.0000
Foreign direct investment	0.0696	0.1320	-0.062	0.0000
GDP per capita	0.0725	0.1460	-0.074	0.0000
GINI index	0.0704	0.1350	-0.065	0.0000
Health expenditure, public (% of GDP)	0.0708	0.1420	-0.071	0.0000
Health expenditure, public (% of government expenditure)	0.0704	0.1380	-0.068	0.0000
Improved sanitation facilities, urban (% of urban population with access)	0.0696	0.1400	-0.071	0.0000
Inflation	0.0698	0.1340	-0.064	0.0000
Mobile cellular subscriptions (per 100 people)	0.0718	0.1430	-0.071	0.0000
Unemployment, total (% of total labor force)	0.0682	0.1310	-0.063	0.0000
Polity index	0.0702	0.1390	-0.069	0.0000

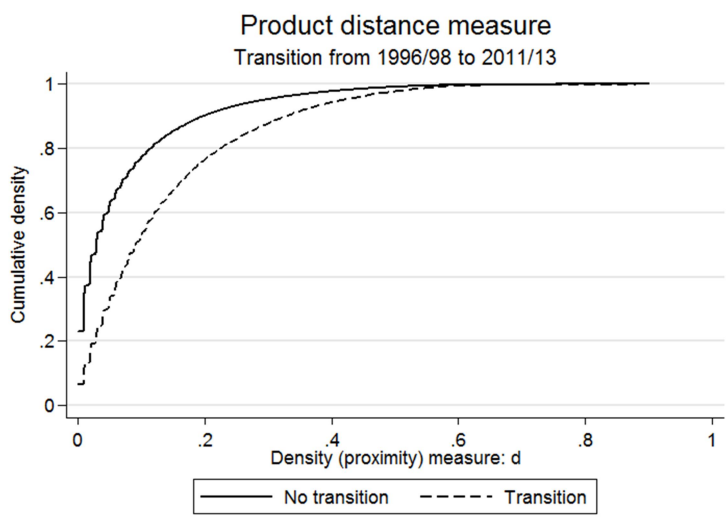
Notes**:** the p-value refers to a simple test of the difference in means. The null hypothesis is equality of means. One observation refers to a product-country combination that was not occupied in period 1. The transition refers to the transition from period 1 to period 4.
Source: own calculations.

Before turning to the regression analysis, it is convenient to show how the distributions of these density variables, and not only their mean, change depending on the nature of the industry dynamics observed in the countries sample. For that purpose, we depict a few cumulative plots for different definitions of density variables. The five cases presented here consider the dynamic performance of the products in a long term perspective (15 years, starting in 96/98). It is important to recall that these variables are calculated with data for the starting period, while the transition is identified between

periods: t and $t + \tau$. The two plotted lines refer, respectively, to products that are eventually produced in the end period (transition case) and those that are not produced in the end period (no transition case).

Graph 4 displays the cumulative distribution of the density variable that is based exclusively on the proximity measure derived from export co-occurrence (ω_{cpt}). We can observe a clear first order stochastic dominance of those products having transited from not being produced competitively (dashed line). This suggests that a product that transited has a higher average proximity to already occupied nodes (i.e. nodes in the country's export profile) than a product that did not transited. This result is in line with the finding in the literature of local navigation through the product space (Hausmann *et al*, 2006 and Hidalgo *et al*, 2007).

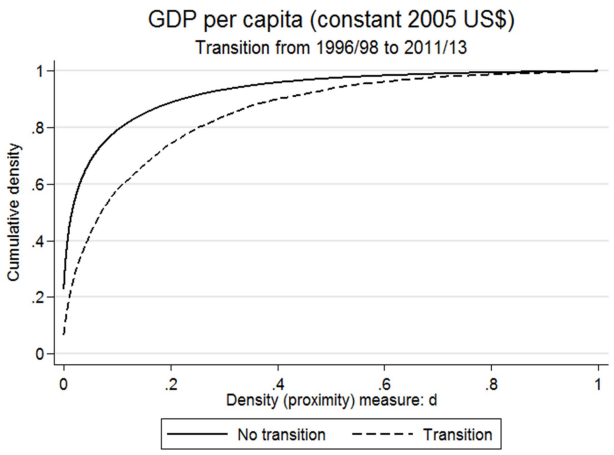
Graph 4



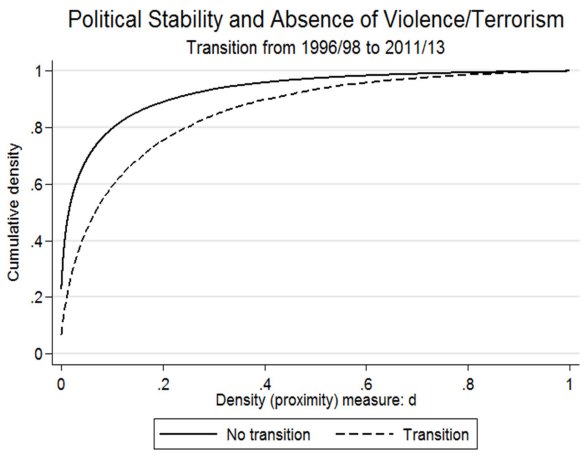
Next, in Graphs 5-8, we plot cumulative distribution of adjusted densities (ω^{k}_{cpt}). These graphs display such cumulative functions for one indicator of each dimension of capabilities. A similar pattern can be observed in each of the selected indicators. The products that had a transition from not being to being developed always first order dominate the products that did not transit, irrespectively if the proximity measure was adjusted with respect to distance in terms of GDP per capita, political stability,

the polity index or the post-materialist index. We obtain similar results for the other indicators of culture, governance and economic structures included in the analysis. Consequently, these preliminary findings strongly indicate that densities in all these coupled networks seem to exert an impact on the probability of an industry becoming competitive. In order to corroborate this statement they need to be included simultaneously in an econometric model, as we do in the following section.

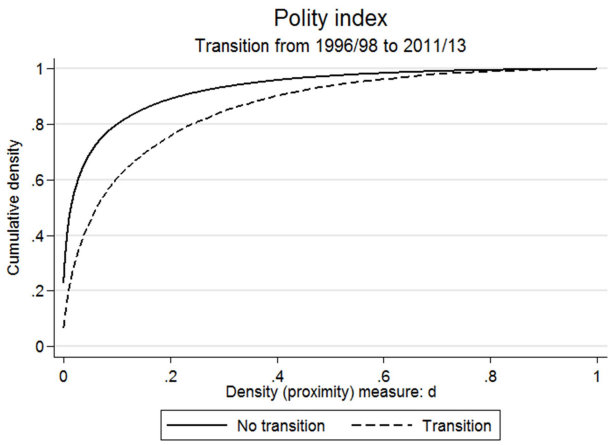
Graph 5



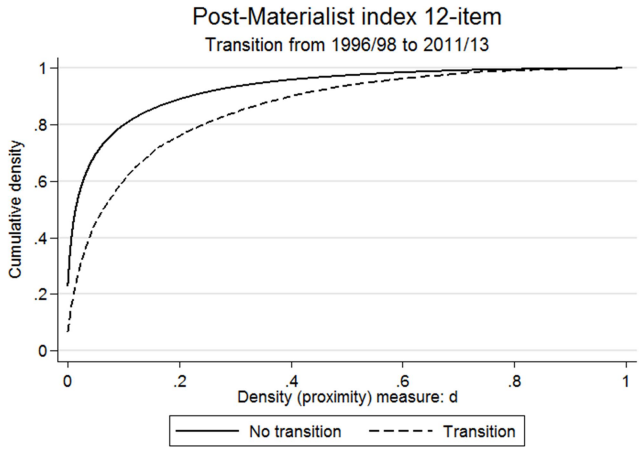
Graph 6



Graph 7



Graph 8



5. Results of the logit model.

The use of an econometric model allows us to estimate the effect of the various density measures simultaneously and, then, to see which measures best explain the likelihood of transition. For that aim, we estimate several specifications of the model. The preferred model includes all the density measures and four control variables as suggested in the methodology section. We include the opportunity gain in a quadratic specification as the positive effect on the probability of a transition taking place might be reduced for very large gains, which are generally associated with high costs and risks. Likewise, it is important to emphasize that the inclusion of economic complexity (ECI) as a control variable, besides the interest in estimating the direct effect of this variable, has to do with the need of capturing cross-country variation in the overall likelihood to start new products. Failing to capture this variation might lead to omitted variable biases.

The marginal effects estimated for the preferred logit model, and presented in Table 6, indicate that the density measure calculated with co-occurrence proximities has always a positive impact and it is statistically significant in the medium (10 years) and long term (15 years), as shown in the corresponding columns. The fact that the original density variable is significant as well as many other types of densities shows that the effect of productive capabilities can be separated from the effect of social affinities with different capabilities. Consequently, the hypothesis that a system of coupled networks prevails to explain the appearance of competitive industries is not rejected. Notice that the number of variables that are statistically significant in the three models is almost identical (18, 16 and 20 for columns 1, 2 and 3, respectively). Moreover, the magnitude of the positive marginal effect increases with the span of the transition for all but one density variables that are significant.

Table 6
Logit model estimation for product transitions (w/ECI for controlling cross country variation)

VARIABLES	(2) Short term transitions	(3) Medium term transitions	(1) Long term transitions
Product distance measure	0.00987	0.0772***	0.0770***
	(0.00922)	(0.0141)	(0.0215)
Post-Materialist	0.00649***	0.00512	0.0107**
	(0.00223)	(0.00346)	(0.00533)
Autonomy	0.00357	0.0115***	0.00979*
	(0.00228)	(0.00343)	(0.00529)
Overall Secular Values	0.00108	0.00297	0.00901*
	(0.00222)	(0.00340)	(0.00515)
Defiance	0.00583***	0.0140***	0.0159***
	(0.00217)	(0.00323)	(0.00490)
Disbelief	0.00261	-0.00429	-0.000391
	(0.00227)	(0.00351)	(0.00538)
Skepticism index	0.00578***	-0.000555	0.0108**
	(0.00218)	(0.00339)	(0.00511)
Emancipative values	0.00648***	0.00472	0.0106**
	(0.00211)	(0.00331)	(0.00482)
Control of Corruption	0.00274	0.00398	0.00649
	(0.00224)	(0.00342)	(0.00515)
Government Effectiveness	0.00343	0.00389	-0.00355
	(0.00224)	(0.00344)	(0.00544)
Political Stability and Absence of Violence/Terrorism	0.00463**	0.00815**	0.0110**
	(0.00221)	(0.00336)	(0.00497)
Regulatory Quality	0.00520**	0.00658**	0.0173***
	(0.00219)	(0.00331)	(0.00516)
Rule of Law	0.00744***	0.00965***	0.0105**
	(0.00222)	(0.00342)	(0.00522)
Voice and Accountability	0.00448*	0.00939***	0.0148***
	(0.00230)	(0.00347)	(0.00527)
Foreign direct investment	-0.00290	-0.00485	-0.00898
	(0.00241)	(0.00364)	(0.00552)
GDP per capita	0.00998***	0.0139***	0.0151***
	(0.00222)	(0.00337)	(0.00514)
GINI index	0.00460**	0.00408	0.00165
	(0.00220)	(0.00333)	(0.00517)
Health expenditure, public (% of GDP)	0.0106***	0.0133***	0.0146***
	(0.00213)	(0.00320)	(0.00487)
Health expenditure, public (% of government expenditure)	0.00720***	0.0104***	0.00342
	(0.00233)	(0.00347)	(0.00552)
Improved sanitation facilities, urban (% of urban population with access)	0.0103***	0.0111***	0.0143***
	(0.00220)	(0.00344)	(0.00518)
Inflation, GDP deflator (annual %)	-0.000330	-0.00336	-0.00562
	(0.00233)	(0.00357)	(0.00547)
Mobile cellular subscriptions (per 100 people)	0.00328	0.00915***	0.00922*
	(0.00232)	(0.00341)	(0.00532)
Unemployment, total (% of total labor force)	0.000985	0.000874	-0.00656
	(0.00236)	(0.00364)	(0.00554)
Polity index	0.00371*	-0.00146	0.0124**
	(0.00225)	(0.00348)	(0.00528)
Product complexity	-0.00823***	-0.0109***	-0.0122***
	(0.000284)	(0.000427)	(0.000653)
Opportunity gain	0.111***	0.160***	0.197***
	(0.00309)	(0.00456)	(0.00698)
Opportunity gain (squared)	-0.101***	-0.135***	-0.163***
	(0.00333)	(0.00467)	(0.00694)
Complexity of the economy	0.00143***	0.00260***	0.00612***
	(0.000368)	(0.000572)	(0.000870)
Observations	390,133	251,250	130,341

Notes: Margin effects, standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

We can see that six out of seven density variables from the cultural dimension present at least one statistical significant marginal effect, being the exception the disbelief sub-index. In the case of the governance dimension, there are four out of six density variables with all statistically significant marginal effects, being the exceptions control of corruption and government effectiveness. The economic dimension provides six out of nine indicators that are significant in at least one time span, being the exceptions: FDI, inflation and unemployment. Moreover, the largest marginal effect in the three runs is found in the medium- and long- term coefficients associated to productive capabilities (i.e., original density measure), but the consolidated effect of all social capabilities seem to be very relevant.

5.a. Interpretation of the estimations.

A positive and significant marginal effect for a density of a particular social capability means that the more similarity there is between the unoccupied node and neighboring nodes that belong to the export profile, the more likely is to observe a transition. This implies that nodes with low or high imputed values of the corresponding indicator can transit equally as long as both have a small distance in capabilities with respect to nodes already produced in the country. As an example, when a country presents a weak rule of law, it is likely that the country can become competitive in similar industries with respect to this capability, and unlikely that it could develop competencies in products associated with high level of rule of law. This result of the model is extremely important given that it reinforces the likelihood that two countries with opposite endowments of social capabilities will follow very different types of structural transformation in their economies, increasing the income gap between them.

When the marginal effect of an adjusted density is not significant, it means that unoccupied nodes with similar social capabilities to those prevailing in the export profile are not more likely to transit than unoccupied nodes far away from the export profile. However, this result does not imply that

a country with a reduced value of such capability has relatively good chances of developing an industry with a high imputed social value in a well-positioned location of the product space. Although not tested in the model, a tentative explanation for the lack of significance has to do with countries with a high social capability value jumping short and large distances in the product space, irrespectively of the nodes' imputed values.[27] The only thing we can say with the econometric estimates is whether or not a social capability is able to explain the observed patterns of structural transformation.

Therefore, the lack of significance in the logit model for six variables in different dimensions of social capabilities suggests that the corresponding networks do not have the proper proximity metrics to explain the navigation process of countries. These variables are the following: cultural disbelief, government effectiveness, control of corruption, foreign direct investment, inflation and unemployment. In contrast, the density variable for the Polity index, our only indicator of a political dimension, exhibits a positive and significant coefficient in the short and long-term transitions and, in this sense, the imputed values for degree of democracy also contribute to explain development paths.

With regard to the control variables, all of them present significant marginal effects with the expected sign in the three transition periods. A negative PCI coefficient means that, holding everything else constant, it is more likely to start producing less complex products as they generally induce smaller costs. A positive coefficient for the linear term of opportunity gains implies that a country is more likely to start producing a good where the potential gain is larger; however, the negative coefficient for the quadratic term indicates that the positive impact on the transition probability is ameliorated for very large gains. Finally, a positive ECI coefficient means that countries with better fundamentals, reflected

[27] For example, an increase in government effectiveness can make a country to develop an industry that usually goes along with countries with effective governments but also other industries where countries with effective governments do not prevail.

in their overall ability to combine a large set of capabilities, have more chances to have a dynamic structural transformation.

5.b. Specification tests.

Table 7 presents two pieces of information for each transition period. Firstly, in the first column we exhibit a test of joint significance of all density variables for each dimension of social capabilities (governance, economic structure, social values, political). The idea is to see whether the density variables included in the various dimensions matter significantly, irrespectively of the transition period considered. Secondly, in the second column of each transition period, we show the relative contribution of each dimension to the overall explanation of the transition dynamic observed between 1996 and 2013. Our computation of the relative contribution is based on the group-wise Shapley decomposition [Shorrocks, 1982].

Table 7
Joint significance and relative contributions

	Short term regression		**Medium term regression**		**Long term regression**	
Density and control variables:	**Joint significance (χ^2/ p-value)**	**Shapley value (relative contribution)**	**Joint significance (χ^2/ p-value)**	**Shapley value (relative contribution)**	**Joint significance (χ^2/ p-value)**	**Shapley value (relative contribution)**
Original density		10.4%		13.5%		13.4%
Cultural density	44.23 (0.000)	11.5%	39.79 (0.000)	13.3%	37.18 (0.000)	14.4%
Governance density	43.10 (0.000)	13.0%	40.83 (0.000)	15.0%	39.17 (0.000)	15.1%
Economic density	94.18 (0.000)	14.2%	73.74 (0.000)	16.0%	35.93 (0.000)	15.0%
Political density	2.72 (0.099)	5.5%	0.176 (0.675)	6.1%	5.52 (0.017)	7.3%
Control variables		45.3%		36.1%		34.8%

The joint significance test is based on a Wald test. This test statistic follows a χ^2distribution. The relative contribution was computed using the group-wise shapley value and can be interpreted as the average contribution to the pseudo R squared of each group of explanatory variables.

The Wald tests of joint significance show that our three main dimensions of social capabilities are statistically significant as explanatory variables of the transition dynamics. Although, political

density is not a significant variable in the model for medium term transitions. Moreover, according to the Shapley value, the four dimensions substantially contribute to the model. The political dimension is the smallest contributor, yet this result is the consequence of considering only one indicator of this type in the model. Among the density measures, the economic indicators matter the most in the short and medium terms, which can of course also be due to the larger number of indicators. However, in the long term, the governance dimension contributes slightly more than the cultural and economic dimensions. As suggested previously, the social capabilities combined matter much more than the original density measure. Furthermore, the control variables account for up to 45.3% of the explanatory power of the model.

Notice that the contribution of the density variables *vis-à-vis* the control group increases from the short to the long term transition model. The increase is especially notorious for the cultural indicators. In brief, with these results it is possible to say that the view of coupled networks, that combine the influences from different arenas, help to explain how structural transformations proceed in the world economy. Moreover, social capabilities combined seem to exert a larger effect on the dynamic transition than the productive capabilities that are employed in specific sectors of economic activity. Appendix B of this article presents the estimation results of three alternative models that support the previous inferences and interpretations.

6. Conclusion.

In this paper we argue that in order to have a better understanding of the process of economic development, it is important to move away from analyses that use exclusively cross-section and longitudinal information at the country level. In studies of this sort, for instance, it is frequently stated

that a good human capital or a strong rule of law are associated with long-term growth and more development. However, these outcome variables are in fact related to the process of structural transformation that countries experience unless they are stuck in a poverty trap. Accordingly, to get a better picture of how countries develop, it is critical to analyze with detail how industries evolve and, thus, a micro-data analysis becomes indispensable.

With an innovative methodology that combines information of countries' exports at the level of 4-digits in the Harmonized System (HA-4) with country level indicators for social capabilities, we show that it is not necessary to have a good structure of governance, appropriate economic infrastructure and human capital, or certain cultural attributes for countries to exhibit competitive industries in world markets. In particular, our analysis makes clear that countries' governance is not a bottleneck for the existence of developed industries. Competitive production is possible whether the value of the corresponding indicators is high or low; in fact, the nature of governance has more to do with the pattern of specialization than with existence of exports in general.

According with our results, these patterns are closely related to variables in the governance dimension such as voice & accountability and rule of law, variables in the cultural dimension such as disbelief, and variables in the economic dimension such as access to improved sanitation facilities in the urban sector. In all these cases, our imputed values of these social capabilities exhibit a relatively large dispersion. That is, there are competitive industries in countries that have strong performance in these indicators, but also other industries are developed in countries where their performance in the same indicators is rather weak[28].

[28] On the contrary, when the dispersion of the imputed values of these indicators (IVIs) is low, this could mean two things: the corresponding social capability is not informative with regard to the performance of industries in general, or all competitive industries are associated to a specific intensity of these indicators. Unfortunately, our data and method cannot discriminate between the two hypotheses.

Our calculations also show that the imputed values for social capabilities are not randomly spread in the product space in any of the four dimensions considered here. Instead, these indicators tend to be stronger in products located in central parts of the network, where complex industries are usually positioned, and tend to be weaker in peripheral and unsophisticated products. This spatial correlation is especially relevant for all capabilities of the governance dimension. This implies not only that there are complex industries where countries with a high revealed comparative advantage exhibit a strong governance, but also relatively unsophisticated industries that are well developed in countries with weak governance. This finding is consistent with the wide dispersion of the imputed values of these indicators, as referred previously.

Moreover, particular social affinities between industries are important contributors for the appearance of new industries. This means that countries with either a high or low intensity in one of these capabilities have more possibilities of observing new developments in a location of the product space where industries exhibit a similar intensity. A key implication of this result is that such social capabilities exert a statistical and meaningful role in explaining development paths and, hence, the widening of the gap between rich and poor countries.

We present econometric evidence that supports the hypothesis that these divergent paths are generated by the productive capabilities available at the local level, but also by the similarities between the imputed values of social capabilities. According to our estimates, the following capabilities seem to exert a significant role: cultural defiance, political stability & absence of violence/terrorism, regulatory quality, rule of law, voice & accountability, GDP per capita (as a proxy of productivity), health expenditure as a percentage of GDP, and improved sanitation facilities for the urban population. All density variables for these indicators present a statistically significant marginal effect on industries becoming developed, irrespectively of the span of time used to analyze transitions.

The reader should not interpret our estimations as meaning that other social capabilities, such as control of corruption, government effectiveness and foreign direct investment, are not viable mechanisms to modify the productive structure of a particular country. For instance, it is feasible that FDI can solve coordination problems in a country and to make possible export production even in in industries that tend to be competitive in countries with low levels of FDI. The statistical evidence presented in the paper only establishes that there is a set of indicators for which we were not capable of identifying a specific pattern of structural transformation.

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Appendix A

Products' ranking according to their imputed values of social capabilities (IVIs)

Through a micro-data analysis at the product level (2 digits), we can see that countries with weak indicators of governance and/or poor economic infrastructure have competitive industries, although they are usually positioned in the periphery of the product space. Tables A.1 and A.2 from this Appendix make evident that a high (low) IVIs is, in the majority of the cases associated to a high (low) product complexity, irrespectively of the indicator considered[29]. Furthermore, the selected social capabilities for our three dimensions show that the top 20 products, in terms of their imputed values, correspond to only 38 industries. Although, there are variations in the rankings for each IVI, all governance and economic indicator coincide in pointing out that 11 products out 38 industries are positioned in the top 20.

Moreover, 'defiance', the only cultural indicator that we analyze in the appendix, coincides with the top positions in 7 of these 11 products. However, it is interesting to notice that among the top IVIs in this capability there are 7 products which are not present in the top 20 of the other indicators. This means that some of the countries' cultural values are associated with competitive industries in the product space, despite the fact that the corresponding IVIs of the governance and economic dimensions are not always top. Examples of these industries are: "Umbrellas, sun umbrellas, walking-sticks, seat-sticks, whips, riding-crops and parts thereof", "Toys, games and sports requisites; parts and accessories thereof", and "Printed books, newspapers, pictures and other products of the printing industry; manuscripts, typescripts and plans".

[29] The indicators that we analyze in this appendix were selected because their density variables in the logit model were statistical significant in all transition periods.

Similar inferences can be derived with regard to the ranking of the bottom 20 IVIs. That is, all social capabilities present products in the bottom 20 that belong to a relatively narrow set of industries (34). Likewise, the ranking positions vary for the different IVIs, yet 9 products out of these 34 coincide in having very low imputed values for indicators in the economic and governance dimensions. Then, the selected cultural value (defiance) has a coincidence in 8 out of these 9 products in terms of their poor ranking. However, in 4 products this cultural capability is unique in having a low ranking that is not shared by the governance and economic capabilities. Examples of these are the following: "Sugars and sugar confectionery" and "Lead and articles thereof".

As a curiosity, "Albuminoidal substances; modified starches; glues; enzymes" (PCI=1.688) is a highly ranked product in all economic and governance indicators, while "Lac; gums, resins and other vegetable saps and extracts" (PCI= -2.119) is always one of the lowest ranked product. A strong voice and accountability seems to be relevant in countries that produce "Ships, boats and floating structures" despite the fact it is an unsophisticated product (PCI= -0.115). Then, a high cultural value of defiance seems to be related with competitive production in "Prepared feathers and down and articles made of feathers or of down; artificial flowers; articles of human hair" despite of being unsophisticated (PCI = -0.767). On the contrary, a relatively complex product like "Musical instruments; parts and accessories of such articles" (PCI= 2.094) tends to be produced in countries that exhibit poor sanitation facilities in the urban sector, while "Tin and articles thereof" (PCI= 1.48) is also produced in countries lacking defiance values.

Table A.1
Top 20 positions of IVIs according to social capability
(number of ranking, from 1 to 20)

	Product description	**PCI**	**PS**	**RQ**	**RL**	**VA**	**GP**	**HE**	**IS**	**DE**
1	Works of art, collectors' pieces and antiques.	1.23778272	1	9	4	3	5			
2	Albuminoidal substances; modified starches; glues; enzymes.	1.68790937	2	1	1	1	3	1	5	20
3	Ships, boats and floating structures.	-0.1152795	3			10				
4	Pharmaceutical products.	2.06517983	4	18	6	13	2	3	6	
5	Photographic or cinematographic goods.	2.75895143	5	3	2	5	1	2	15	
6	Pulp of wood or of other fibrous cellulosic material; recovered (waste and scrap) paper or paperboard.	1.49842131	6	2	3	2	10	8	7	4
7	Preparations of meat, of fish or of crustaceans, mollusks or other aquatic invertebrates.	-0.2426024	7	20	17	19			19	
8	Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof	2.46044493	8	6	9	7	7	7	9	6
9	Meat and edible meat offal.	0.78891337	9	7	11	4	14	5	18	
10	Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; parts and accessories thereof	2.65237045	10	5	7	8	6	12	13	18
11	Cork and articles of cork.	0.39789897	11		8	6	20	6	1	
12	Fish and crustaceans, mollusks and other aquatic invertebrates.	-1.8823687	12					14		
13	Clocks and watches and parts thereof.	2.12682891	13	11	14		13			19
14	Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere specified or included.	0.5383057	14	16	16	15	19	11	20	
15	Plastics and articles thereof	1.96065247	15	10	12	12	8	10	3	16
16	Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles.	2.3113687	16	14	18				17	
17	Organic chemicals.	2.26759934	17	4	5	11	4	20	8	17
18	Vehicles other than railway or tramway rolling-stock, and parts and accessories thereof.	1.79877865	18	17			17			8
19	Paper and paperboard; articles of paper pulp, of paper or of paperboard.	1.44302106	19	12	15	9	15	15	11	14
20	Miscellaneous articles of base metal.	1.87745166	20							10
21	Aircraft, spacecraft, and parts thereof.	1.85691428		8	10	14	11	9	10	
22	Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings; lamps and lighting fittings, not elsewhere specified or included; illuminated signs and the like; prefabricated buildings.	1.5345825		13				19	4	
23	Miscellaneous chemical products.	1.96730423		15	13	18	9	18	16	15

24	Tools, implements, cutlery, spoons and forks, of base metal; parts thereof of base metal.	2.29878187		19			16			3
25	Arms and ammunition; parts and accessories thereof.	1.83937192			19	20	18	13		
26	Nickel and articles thereof.	1.79743433			20		12	4	14	
27	Tin and articles thereof.	1.47993231				16				
28	Tanning or dyeing extracts; tannins and their derivatives; dyes, pigments and other coloring matter; paints and varnishes; putty and other mastics; inks.	1.42263377				17				
29	Live animals.	0.09382349						16		
30	Railway or tramway locomotives, rolling-stock and parts thereat railway or tramway track fixtures and fittings and parts thereof; mechanical (including electro-mechanical) traffic signaling equipment of all kinds.	1.80599845						17	2	9
31	Articles of stone, plaster, cement, asbestos, mica or similar materials.	1.37103605							12	
32	Umbrellas, sun umbrellas, walking-sticks, seat-sticks, whips, riding-crops and parts thereof	1.64927328								1
33	Musical instruments; parts and accessories of such articles.	2.09439588								2
34	Toys, games and sports requisites; parts and accessories thereof	1.50388646								5
35	Printed books, newspapers, pictures and other products of the printing industry; manuscripts, typescripts and plans.	1.56530452								7
36	Iron and steel.	1.51775003								11
37	Prepared feathers and down and articles made of feathers or of down; artificial flowers; articles of human hair.	-0.766747								12
38	Impregnated, coated, covered or laminated textile fabrics; textile articles of a kind suitable for industrial use.	2.00785399								13

* Source: own elaboration. Governance dimension: PS = Political Stability and Absence of Violence/Terrorism, RQ = Regulatory Quality, RL = Rule of Law, VA = Voice and Accountability; Economic dimension: GP =GDP per-capita, HE =Health Expenditure, public (%GDP), IS= Improved Sanitation Facilities; Cultural dimension: DE= Defiance.

Table A.2
Bottom 20 positions of IVIs according to social capability
(Number of ranking, from 20 to 1)

	Product description	**PCI**	**PS**	**RQ**	**RL**	**VA**	**GP**	**HE**	**IS**	**DE**
1	Live trees and other plants; bulbs, roots and the like; cut flowers and ornamental foliage.	-0.98006088	20						10	
2	Ores, slag and ash.	-2.08963466	19	13	9	8	8	20	8	11
3	Fertilisers.	-0.6751523	18			15				
4	Other vegetable textile fibres; paper yarn and woven fabrics of paper yarn.	-1.05325162	17	19			16	8	6	17
5	Man-made staple fibres.	0.65380406	16					18		
6	Headgear and parts thereof	-0.04795716	15	15	10		14	11	12	15
7	Live animals.	0.09382349	14		18	11				
8	Cocoa and cocoa preparations.	-2.52238488	13	9	5	19	10	6	1	1
9	Articles of apparel and clothing accessories, knitted or crocheted.	-1.42801416	12	18	4	5	5	4	19	10
10	Articles of apparel and clothing accessories, not knitted or crocheted.	-0.72276747	11	6	8	6	7	5	15	
11	Edible fruit and nuts; peel of citrus fruit or melons.	-1.87012541	10	11	6	13	11	12	16	3
12	Special woven fabrics; tufted textile fabrics; lace; tapestries; trimmings; embroidery.	0.51105809	9		20	16		14		
13	Edible vegetables and certain roots and tubers.	-1.56263292	8	8	13	7	15	15		4
14	Raw hides and skins (other than fur skins) and leather.	-1.56061971	7	14	11	12	18		13	
15	Other made up textile articles; sets; worn clothing and worn textile articles; rags.	-0.51140839	6	20	17		9	10	11	
16	Coffee, tea, mate and spices.	-2.12400293	5	4	3	4	3	3	3	16
17	Vegetable plaiting materials; vegetable products not elsewhere specified or included.	-2.15047622	4	2	2	2	2	1	4	2
18	Cotton,	-1.4569	3	10	12	9	12	7	14	8
19	Carpets and other textile floor coverings.	0.57691085	2	17		10		19		12
20	Lac; gums, resins and other vegetable saps and extracts.	-2.11928558	1	1	1	1	4	2	2	5
21	Fish and crustaceans, molluscs and other aquatic invertebrates.	-1.88236868		16						
22	Salt; sulphur; earths and stone; plastering materials, lime and cement.	-0.4109292		12			20	17	17	14
23	Tobacco and manufactured tobacco substitutes.	-1.66999722		7	15	20	13		7	6
24	Silk.	0.12579379		5	14	3		13		7
25	Manufactures of straw, of esparto or of other plaiting materials; basket ware and wickerwork.	-2.10031319		3	7	14	1		5	

26	Oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruit; industrial or medicinal plants; straw and fodder.	-1.05922222			19		17		20	
27	Footwear, gaiters and the like; parts of such articles,	-0.54303581			16	18	6			
28	Prepared feathers and down and articles made of feathers or of down; artificial flowers; articles of human hair.	-0.766747				17	19	9	9	
29	Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral waxes.	-0.63786376						16		20
30	Musical instruments; parts and accessories of such articles.	2.09439588							18	
31	Tin and articles thereof.	1.47993231								19
32	Lead and articles thereof	0.35732633								18
33	Sugars and sugar confectionery.	-0.72372556								13
34	Cork and articles of cork.	0.39789897								9

* Source: own elaboration. Governance dimension: PS = Political Stability and Absence of Violence/Terrorism, RQ = Regulatory Quality, RL = Rule of Law, VA = Voice and Accountability; Economic dimension: GP =GDP per-capita, HE =Health Expenditure, public (%GDP), IS= Improved Sanitation Facilities; Cultural dimension: DE= Defiance.

Appendix B
Alternative model specifications

We present in Table B.1 the results of a logit model with the original density variable plus all control variables. The idea here is to identify how different the marginal effects of the base density are when the densities of social capabilities are not included in the regression. For the three transition periods, the density variable is significant and the estimated marginal effects are positive and increase with the term of the transition. In the three case, the magnitude of the marginal effects is substantially larger to the one observed in the first row of Table 5 (0.118 vs 0.00987, 0.203 vs 0.0772 and 0.250 vs 0.0770). Likewise all control variables remain statistically significant and their marginal effects have the same sign as in the preferred model. The lower marginal effects imply that once social capabilities are differentiated from productive capabilities, the impact of the latter on the transition dynamics is diminished.

Table B.1
Logit model without social capabilities
(Marginal effects of transition probabilities)

VARIABLES	(1) Short term transitions	(2) Medium term transitions	(3) Long term transitions
Original density measure	0.118***	0.203***	0.250***
	(0.00260)	(0.00397)	(0.00629)
PCI	-0.00931***	-0.0105***	-0.0124***
	(0.000274)	(0.000398)	(0.000629)
Opportunity gain	0.119***	0.163***	0.206***
	(0.00299)	(0.00433)	(0.00682)
Opportunity gain (squared)	-0.106***	-0.144***	-0.173***
	(0.00317)	(0.00441)	(0.00683)
ECI	0.00171***	0.00248***	0.00574***
	(0.000358)	(0.000547)	(0.000853)
Observations	408,745	269,666	132,685

Notes: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

In the model specification presented in Table B.2, where we do not include the ECI variable, the magnitude of all marginal effects is very similar with respect to the estimations of Table 6. Moreover, the number of significant variables is practically the same (17, 15 and 19 for the small, medium and long term transitions, respectively). Even more, the set of variables that do not statistically explain the probability of transition are the same than in the preferred model. Therefore, the inclusion or exclusion of overall economic complexity at the country level does not modify the inferences derived from the preferred model.

In the final specification presented in Table B.3, we replace ECI by country fixed effects. Including country fixed effects might help to reduce even more the risk of time invariant omitted variables. However, the cost of this approach is that the fixed effects take out a substantial amount of variability and therefore the identification of marginal effects on probability transitions is only based on within country differences. Again the magnitude of all marginal effects is similar with respect to the estimations of Table 6. However, as expected, the number of significant variables is smaller (15, 12 and 12 for the small, medium and long term transitions, respectively). In particular, regulatory quality, rule of law and voice and accountability lose their significance in some but not all transition types. Nonetheless, the statistical results are still in favor of not rejecting the null hypothesis that the different dimensions of social capability are relevant for explaining local development paths.

Table B.2
Logit model without ECI (marginal effects of transition probabilities)

VARIABLES	(1) Short term transitions	(2) Medium term transitions	(3) Long term transitions
Product distance measure	0.0148	0.0857***	0.0968***
	(0.00914)	(0.0140)	(0.0214)
Post-Materialist	0.00660***	0.00539	0.0116**
	(0.00223)	(0.00347)	(0.00536)
Autonomy	0.00362	0.0117***	0.00987*
	(0.00228)	(0.00344)	(0.00532)
Secular Values	0.00108	0.00304	0.00934*
	(0.00223)	(0.00340)	(0.00517)
Defiance	0.00582***	0.0140***	0.0160***
	(0.00217)	(0.00323)	(0.00493)
Disbelief	0.00266	-0.00410	2.00e-05
	(0.00228)	(0.00352)	(0.00540)
Skepticism index	0.00587***	-0.000447	0.0111**
	(0.00218)	(0.00340)	(0.00514)
Emancipative values	0.00642***	0.00459	0.0101**
	(0.00211)	(0.00332)	(0.00485)
Control of Corruption	0.00259	0.00368	0.00601
	(0.00224)	(0.00342)	(0.00518)
Government Effectiveness	0.00330	0.00367	-0.00431
	(0.00225)	(0.00345)	(0.00547)
Political Stability and Absence of Violence/Terrorism	0.00462**	0.00817**	0.0113**
	(0.00221)	(0.00337)	(0.00500)
Regulatory Quality	0.00503**	0.00626*	0.0162***
	(0.00219)	(0.00332)	(0.00519)
Rule of Law	0.00733***	0.00940***	0.00989*
	(0.00222)	(0.00343)	(0.00525)
Voice and Accountability	0.00441*	0.00926***	0.0148***
	(0.00230)	(0.00348)	(0.00530)
Foreign direct investment	-0.00291	-0.00479	-0.00871
	(0.00241)	(0.00365)	(0.00554)
GDP per capita	0.00990***	0.0137***	0.0147***
	(0.00223)	(0.00338)	(0.00516)
GINI index	0.00459**	0.00407	0.00175
	(0.00220)	(0.00334)	(0.00518)
Health expenditure, public (% of GDP)	0.0105***	0.0131***	0.0142***
	(0.00213)	(0.00321)	(0.00489)
Health expenditure, public (% of government expenditure)	0.00727***	0.0106***	0.00371
	(0.00233)	(0.00347)	(0.00555)
Improved sanitation facilities, urban (% of urban population with access)	0.0103***	0.0111***	0.0140***
	(0.00221)	(0.00344)	(0.00521)
Inflation,	-0.000376	-0.00347	-0.00572
	(0.00234)	(0.00358)	(0.00551)
Mobile cellular subscriptions (per 100 people)	0.00313	0.00897***	0.00911*
	(0.00232)	(0.00341)	(0.00534)
Unemployment, total (% of total labor force)	0.000966	0.000851	-0.00653
	(0.00236)	(0.00365)	(0.00558)
Polity index	0.00375*	-0.00145	0.0127**
	(0.00226)	(0.00349)	(0.00531)
Product complexity	-0.00781***	-0.0101***	-0.0105***
	(0.000263)	(0.000391)	(0.000607)
Opportunity gain	0.108***	0.154***	0.186***
	(0.00297)	(0.00438)	(0.00679)
Opportunity gain (squared)	-0.100***	-0.133***	-0.161***
	(0.00331)	(0.00466)	(0.00694)
Observations	390,133	251,250	130,341

Notes: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table B.3

Logit model with the fixed effects specification (marginal effects of transition probabilities)

VARIABLES	(1) Short term transitions	(2) Medium term transitions	(3) Long term transitions
Original density measure	0.0298***	0.0857***	0.0947***
	(0.00951)	(0.0145)	(0.0221)
Post-Materialist	0.00611***	0.00442	0.00596
	(0.00219)	(0.00338)	(0.00523)
Autonomy	0.00264	0.0109***	0.00762
	(0.00225)	(0.00336)	(0.00515)
Overall Secular Values	0.000868	0.00149	0.00630
	(0.00219)	(0.00333)	(0.00508)
Defiance	0.00439**	0.0117***	0.0115**
	(0.00215)	(0.00317)	(0.00483)
Disbelief	0.00243	-0.00399	-0.000679
	(0.00224)	(0.00342)	(0.00523)
Skepticism index	0.00535**	-0.00149	0.00990**
	(0.00215)	(0.00334)	(0.00502)
Emancipative values	0.00480**	0.00174	0.00472
	(0.00209)	(0.00327)	(0.00479)
Control of Corruption	0.000160	-0.00108	-0.000364
	(0.00221)	(0.00335)	(0.00503)
Government Effectiveness	0.00123	0.000369	-0.00841
	(0.00222)	(0.00339)	(0.00537)
Political Stability and Absence of Violence/Terrorism	0.00386*	0.00670**	0.00891*
	(0.00218)	(0.00330)	(0.00490)
Regulatory Quality	0.00277	0.00388	0.0129**
	(0.00216)	(0.00324)	(0.00504)
Rule of Law	0.00501**	0.00495	0.00379
	(0.00219)	(0.00338)	(0.00517)
Voice and Accountability	0.00287	0.00728**	0.0145***
	(0.00228)	(0.00341)	(0.00517)
Foreign direct investment	-0.00280	-0.00374	-0.00850
	(0.00235)	(0.00354)	(0.00534)
GDP per capita	0.00790***	0.00907***	0.00850*
	(0.00220)	(0.00332)	(0.00505)
GINI index	0.00438**	0.00453	0.00443
	(0.00216)	(0.00325)	(0.00502)
Health expenditure, public (% of GDP)	0.00858***	0.0101***	0.0116**
	(0.00210)	(0.00314)	(0.00475)
Health expenditure, public (% of government expenditure)	0.00656***	0.00890***	0.00123
	(0.00229)	(0.00339)	(0.00541)
Improved sanitation facilities, urban (% of urban population with access)	0.00970***	0.0104***	0.0126**
	(0.00216)	(0.00335)	(0.00505)
Inflation,	-0.000588	-0.00418	-0.00614
	(0.00230)	(0.00350)	(0.00535)
Mobile cellular subscriptions (per 100 people)	0.00209	0.00641*	0.00549
	(0.00228)	(0.00334)	(0.00523)
Unemployment, total (% of total labor force)	0.00107	5.09e-05	-0.00789
	(0.00231)	(0.00355)	(0.00540)
Polity index	0.00308	-0.00274	0.0105**
	(0.00221)	(0.00341)	(0.00513)
Product complexity	-0.00286***	0.000285	0.00121
	(0.000376)	(0.000581)	(0.000908)
Opportunity gain	0.0543***	0.0452***	0.0627***
	(0.00384)	(0.00578)	(0.00892)
Opportunity gain (squared)	-0.0763***	-0.0920***	-0.113***
	(0.00343)	(0.00481)	(0.00715)
Observations	390,133	251,250	130,341

Notes: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1