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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

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TECHNOLOGY-DRIVEN STRUCTURAL CHANGE AND INCLUSIVENESS – THE ROLE OF MANUFACTURING

RESEARCH, STATISTICS AND INDUSTRIAL POLICY BRANCH

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Technology-driven structural change and inclusiveness
The role of manufacturing

Alejandro Lavopa
UNIDO Consultant

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

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Abstract

Structural change is typically associated with the shift of labour towards activities with higher levels of productivity and technological content. In the empirical literature, this has mainly been associated with the expansion of manufacturing industries and, within them, the expansion of high-tech industries. In line with this perspective, a large number of empirical studies have demonstrated the important role manufacturing industries play in driving economic growth.

This line of research, however, has focused primarily on economic growth, without paying sufficient attention to the role of manufacturing in driving social inclusiveness. This paper tries to fill this gap by looking at the relationship between the size of manufacturing industries and several indicators of social inclusiveness. In order to do so, it uses panel data techniques to explore the determinants of poverty, income inequality, human development and inclusive industrial development. The original contribution of our approach is that we include the share of manufacturing as a key determinant of these indicators. The relationship is examined in a newly constructed dataset that includes almost 100 countries over the period 1970-2014.

Our results show a positive and highly significant correlation between manufacturing and each of these indicators. Even after controlling for several other variables that might affect a country's level of social inclusiveness (such as income, education and openness), the share of manufacturing has a positive effect on poverty reduction, human development and income equity. Yet not all industries seem to generate the same effect in terms of inclusiveness. According to our results, it is mainly high-tech industries that drive this positive development. Medium-tech industries (mostly natural –resource-intensive industries) are typically negatively associated with social inclusiveness, in line with the so-called natural resource curse.

Keywords: Structural change; manufacturing; social inclusiveness

JEL Classification: C23, L16, O14, O15

1. Introduction

Economic development is intrinsically tied to the transformation of economic structures, from the production of goods with low levels of technological content using low productive techniques to the production of technologically sophisticated goods using highly productive, capital- and knowledge-intensive techniques. Historical records show that those countries that managed to significantly improve their standards of living and close the income and technological gap with the most advanced nations succeeded by pursuing this type of transformation.

This process goes far beyond the acceleration of economic growth and implies broader improvements in the general living standards of society in terms of health, poverty rates, income distribution and several other dimensions that, taken together, define a country’s level of social inclusiveness. The transformation of economic structures is typically associated with the transformation of social structures, mainly through the creation of productive employment that integrates an increasing number of people into the production process. Economic modernization (broadly defined as the expansion of modern activities) provides good quality jobs and better income opportunities for an increasing share of society and, at the same time, triggers a number of indirect and induced mechanisms that reinforce the process (Lavopa (2015)).

Manufacturing industries play a key role in this process. As has been long documented, this sector is the main engine of economic growth and transformation in most cases of successful development. In comparison to other sectors, manufacturing offers special opportunities to exploit static and dynamic economies of scale and embodied and disembodied technological change. Moreover, it has broad productive linkages with other sectors and is typically associated with positive technological spill-overs (Szirmai et al. (2013); Szirmai (2011)). For these reasons, structural change has usually been associated with the changing share of manufacturing in total employment or GDP. Taking this perspective, an extensive empirical literature has examined the role of manufacturing in driving economic growth. The general conclusion is that manufacturing has indeed been a major engine of economic growth, though its importance has changed over time and across regions[1].

The role of manufacturing in driving economic development as a broader concept that also refers to the improvement of certain social dimensions such as poverty alleviation, employment creation and income distribution, has been less explored. Manufacturing industries are typically

[1] See, among others, Fagerberg and Verspagen (1999), (2002); Felipe (1998); Lavopa and Szirmai (2015); Lavopa (2015); Mamgain (1999); Necmi (1999); Rodrik (2009); Szirmai and Verspagen (2015); Szirmai (2011); Wells and Thirlwall (2003).

regarded as playing a fundamental role in providing good quality jobs and reducing poverty[2]. However, only few studies have addressed this issue from a long-term global perspective. Scatter evidence from different studies on the determinants of certain indicators of social inclusiveness (such as income inequality or poverty rates) suggest a positive impact of manufacturing, both in cross-country regressions (Galbraith and Kum (2005); Hasan and Quibria (2004); Kum (2010)) and in specific country or region studies (Acar and Dogruel (2012); Alderson and Nielsen (2002); Chun et al. (2012); Li and Luo (2008)).

The present paper contributes to this literature by analysing the specific role structural change plays in manufacturing industries for a number of social inclusiveness indicators. In order to do so, we follow a similar approach to that in studies that have examined the manufacturing growth nexus. More specifically, we use econometric panel data techniques to study the determinants of various indicators of social inclusiveness, such as income inequality, poverty rates and the human development index. We also pay special attention to the role of structural change in driving these dynamics. In this case, structural change is broadly analysed by looking at the share of manufacturing in total employment. Other explanatory variables include education, income level, degree of openness, natural resources endowment, and age structure of the population. Our approach uses a newly constructed dataset that covers nearly 100 countries over the period 1970-2010.

Our results show that manufacturing actually plays a key role in driving social inclusiveness. The share of manufacturing on total employment is found to have a positive and highly significant correlation with all the social inclusiveness indicators evaluated. Furthermore, we also examine the role of different groups of industries within manufacturing and find that high-tech industries, in particular, are the most suitable for driving inclusiveness.

The paper is structured as follows. In the next section, we present details on the methodology and data used. In Section 3, we briefly summarize the main trends observed in the selected social inclusiveness indicators over the last decades. The main results from our regression analysis are presented in Section 4. First, we analyse the role of manufacturing industries as a whole, without distinguishing across industries. Secondly, we study the role of specific groups within manufacturing. These groups are broadly defined according to the technological content of production following the standard OECD classification. Finally, in Section 5, we discuss the main conclusions of the analysis and propose directions for future research. An appendix with further methodological information is included at the end of the paper.

[2] See Lavopa and Szirmai (2012) for a recent review on this specific topic.

2. Methodology

2.1 Approach

The main objective of this paper is to analyse the relationship between structural change (broadly defined as the expansion of manufacturing industries) and social inclusiveness. Specifically, we address the following research questions:

1) Is the expansion of manufacturing positively correlated with higher inclusiveness?

2) Does this relationship change across country group (by income level), region or time?

3) Are some industries within manufacturing more inclined to foster inclusiveness?

From the many indicators that can be used to analyse a country's level of social inclusiveness, we will only focus on four indicators in this paper, namely: i) the Non-Poor Ratio (NPR), defined as 1 minus the poverty headcount ratio; ii) the Human Development Index (HDI); iii) the Equity Index (EI), defined as 1 minus the Gini index; and iv) the Inclusive Industrialization Development index (IID), defined as the inequality-adjusted wage share in manufacturing industries[3].

We use panel data techniques to examine the main determinants of each of these indicators. Our main focus is on the role the level of industrialization plays (proxied by the share of manufacturing in total employment). Following other similar papers, we postulate that social inclusiveness depends on: i) climate zones (CLIMATE); ii) natural resource endowments (NNRR); iii) per capita income level (y); iv) square of per capita income level (to capture potential non-linearities in incomes); v) openness (OPEN); vi) investment share in GDP (INV); vii) level of education (EDU); viii) age structure (OLD); and ix) manufacturing share in total employment (MEMPsh). We propose the following model:

$$g_{i,t} = \beta_0 + \beta_1 CLIMATE_i + \beta_2 NNRR_i + \beta_3 y_{i,t} + \beta_4 (y_{i,t})^2 + \beta_5 OPEN_{i,t} + \beta_6 INV_{i,t} + \beta_7 EDU_{i,t} + \beta_8 OLD_{i,t} + \beta_9 MEMPsh_{i,t} + v_i + \varepsilon_{i,t} \quad (1)$$

[3] This index has been taken from UNIDO (2015), Chapter 1. It is defined as:

$$IID = (1 - Theil_{MAN}) * MWsh$$

Where $Theil_{MAN}$ is an index of wage pay inequality within manufacturing industries and $MWsh$ is the share of the compensation of employees in total manufacturing value added. Hence, it combines a measure of personal income distribution and a measure of functional income distribution in the case of manufacturing industries.

where, *i* and *t* refer to country and year, *g* denotes the corresponding inclusiveness index (NPR, HDI[4], EI or IID), is a fixed term that accounts for country-specific effects (unobserved individual effects) and represents the error term.

The empirical estimation of this model for each of the social inclusiveness indicators defined above can provide interesting insights to address our first and second research question. To answer the third research question, we need to determine whether certain industry specializations within manufacturing also play a role for the level of social inclusiveness. Specifically, we analyse the impact of three broad groups of manufacturing industries according to technological level, as broadly defined by the OECD in terms of R&D intensity[5]. In order to do so, we expand Model 1 as follows:

$$g_{i,t} = \beta_0 + \beta_1 CLIMATE_i + \beta_2 NNRR_i + \beta_3 y_{i,t} + \beta_4 (y_{i,t})^2 + \beta_5 OPEN_{i,t} + \beta_6 INV_{i,t} + \beta_7 EDU_{i,t} + \beta_8 OLD_{i,t} + \beta_9 MEMPsh_{i,t} + \beta_{10} HTsh_{i,t} + v_i + \varepsilon_{i,t} \quad (2.1)$$

$$g_{i,t} = \beta_0 + \beta_1 CLIMATE_i + \beta_2 NNRR_i + \beta_3 y_{i,t} + \beta_4 (y_{i,t})^2 + \beta_5 OPEN_{i,t} + \beta_6 INV_{i,t} + \beta_7 EDU_{i,t} + \beta_8 OLD_{i,t} + \beta_9 MEMPsh_{i,t} + \beta_{10} MTsh_{i,t} + v_i + \varepsilon_{i,t} \quad (2.2)$$

$$g_{i,t} = \beta_0 + \beta_1 CLIMATE_i + \beta_2 NNRR_i + \beta_3 y_{i,t} + \beta_4 (y_{i,t})^2 + \beta_5 OPEN_{i,t} + \beta_6 INV_{i,t} + \beta_7 EDU_{i,t} + \beta_8 OLD_{i,t} + \beta_9 MEMPsh_{i,t} + \beta_{10} LTsh_{i,t} + v_i + \varepsilon_{i,t} \quad (2.3)$$

where *HTsh*, *MTsh*, and *LTsh* denote the share of high-tech[6], medium-tech[7] and low-tech industries in total manufacturing employment. These groups are defined on the basis of the ISIC classification, Rev. 3 at the two-digit level, following the sectoral classification proposed by Hatzichronoglou (1997) as closely as possible and revised by the OECD (2003)[8]. Note that we also keep MEMPsh in these models to account for the size of manufacturing.

In what follows, we estimate Models (1) and (2) using panel data techniques. We use four different estimators: fixed effects (FE), random effects (RE), between estimator (BE) and the Hausman-Taylor estimator (HT). Our preferred estimator is the HT because it corrects potential endogeneity problems without losing the between country variability (as the fixed effect

[4] In the case of HDI, we do not include education (EDU) and income (y) among the regressors because these variables are already part of the Human Development Index. Hence, they would be highly correlated with the dependent variable by definition.
[5] See Hatzichronoglou (1997) and OECD (2003) for details.
[6] This group actually includes "High-technology" and "Medium-high-technology" industries from the original OECD classification.
[7] This group actually refers to the "Medium-low-technology" industries from the original OECD classification.
[8] More specifically, we include the ISIC codes 15 to 22 as low-tech; the ISIC codes 23 and 25 to 28 as medium-tech; and the ISIC codes 24 and 29 to 35 as high-tech. It is important to stress that the original OECD classification is defined at the 3-digit level of ISIC. Our data, however, only distinguishes industries at the 2-digit level. Therefore, one industry that is originally classified as having medium-low technological content in the OECD definition is classified here as high-tech (this is the case of ISIC code 351, *Building and repairing of ships*).

estimator does). We use 5-year averages in all cases to minimize the effect of potential outliers and maximize the number of country observations for each variable over the period 1970-2010.

2.2 Data

The following sources have been used to build our dataset:

Poverty Headcount Ratio (*Pov*): This variable has been taken from the World Bank's WDI Database[9]. It covers a maximum of 87 countries over the period 1984-2014. In particular, we use the share of population living with less than 2 PPP dollars per day.

Human Development Index (*HDI*): This variable has been taken from UNDP[10]. It covers 103 countries over the period 1980-2012.

Gini Index (*Gini*): Our main source for the Gini index is the SWIID 5.0[11]. This source covers a maximum of 152 countries over the period 1960-2013. Some gaps were filled using the Gini dataset of van Zanden et al. (2014). From the various options offered by the SWIID, we use the Gini index of inequality in equalized (square root scale) household market (pre-tax, pre-transfer) income.

Inclusive Industrialization Development Index (*IID*): As stated before, this variable is constructed by combining two variables: i) wage pay equity within manufacturing industries $(1 - Theil_{MAN})$; and ii) the share of wages in manufacturing value added $(MWsh)$. The sources and procedures used are the following:

> $(1 - Theil_{MAN})$: This variable is calculated as 1 minus the Theil index of pay inequality estimated by the University of Texas Inequality Project (UTIP). This source provides data for 167 countries over the period 1963-2008[12].
>
> $MWsh$: This variable refers to the share of the compensation of employees in total manufacturing value added. It has been calculated from several sources: UNSD[13], EUKLEMS[14], WIOD[15] and INDSTAT[16], and covers a maximum of 123 countries over the period 1970-2012.

9 Available at http://data.worldbank.org
10 Available at http://hdr.undp.org/en/data
11 See Solt (2009) for details. Available at http://myweb.uiowa.edu/fsolt/swiid/swiid.html
12 See Galbraith et al. (2014) for details.
13 UNSD, National Accounts Official Country Data, Table 2.3. *Output, gross value added, and fixed assets by industries at current prices (ISIC Rev. 3).* Available at http://data.un.org
14 Available at http://www.euklems.net/
15 See Timmer et al. (2015) for details. Available at http://www.wiod.org
16 INDSTAT2, 2015, ISIC Rev. 3. Available at https://stat.unido.org/

Temperate zones (*CLIMATE*): Dummy variable that identifies countries with large temperate zones (takes a value of 1 if 50 per cent or more are temperate zones). It has been calculated using the data published by Gallup et al. (1999).

Natural Resources (*NNRR*): Dummy variable that takes a value 1 if the country has above average per capita natural capital. Natural capital, in turn, is calculated from the data published by the World Bank (2010) for the year 2005 over a sample of 115 countries.

Income (*y*): This variable refers to per capita GDP (output side) at constant international dollars of 2005. It has been taken from the PWT 8.1[17] and covers a maximum of 167 countries over the period 1950-2011.

Openness (*OPEN*): This variable is defined as the total of exports plus imports over GDP. It has been calculated using the data of PWT 8.1, and covers 125 countries over the period 1970-2010.

Investment (*INV*): This variable refers to the share of investment in GDP at current prices. It has been taken from PWT 8.1 and covers 125 countries over the period 1970-2010.

Education (*EDU*): This variable refers to the average years of total schooling among the population aged 15 or higher. It has been mainly taken from Barro and Lee (2013).

Age structure (OLD): This variable refers to the share of population aged 65 or higher and has been taken from WDI. It covers a maximum of 116 countries over the period 1970-2012.

Manufacturing Share (*MEMPsh*): This variable is defined as the share of manufacturing in total employment. It has been calculated by UNIDO using several sources (GGDC10, ILO, WIOD and WDI) and covers 125 countries over the period 1970-2010. The shares of different industry groups within total manufacturing employment, in turn, have been calculated on the basis of the INDSTAT2 2015 database.

In most cases, we have filled some of the gaps using intra- and extrapolation techniques over the original data to obtain the maximum number of observations per country/period possible by variable.

The following table summarizes the main descriptive statistics of the constructed dataset:

[17] See Feenstra et al. (2015) for details. Available at http://www.rug.nl/research/ggdc/data/pwt/pwt-8.1

Table 1 Descriptive statistics of the dataset

					Standard Deviation			Observations		
Variable	**Description**	**Mean**	**Min**	**Max**	**Overall**	**Within**	**Between**	**N**	**Obs.**	**Tbar**
NPR	*% of population living with more than 2 PPP dollars a day*	0.64	0.05	1.00	0.32	0.08	0.31	80	491	6.1
HDI	*Human Development Index*	0.64	0.18	0.95	0.19	0.05	0.18	94	606	6.4
EI	*1-Gini Index (pre-tax, pre-transfers)*	0.55	0.31	0.81	7.7	3.9	6.9	112	893	8.0
IID	*Inequality adjusted Compensation of Employees in Manuf. by unit of MVA*	0.41	0.07	0.91	0.17	0.06	0.16	106	696	6.6
CLIMATE	*Climate zones (1=50% or more are temperate zones)*	0.37	0	1	0.48	0	0.49	114	939	8.2
NNRR	*Natural resources (1=above average in pcnk)*	0.19	0	1	0.39	0	0.39	111	924	8.3
y	*per capita GDP (2005 international dollars)*	9,877	251	65,498	10,447	4,870	9,083	117	958	8.2
OPEN	*Openness*	0.53	0.00	16.40	0.81	0.55	0.57	117	958	8.2
INV	*Investment Share in GDP*	0.20	0.02	0.63	0.09	0.05	0.07	117	958	8.2
EDU	*Avg. Years of Total Schooling, population aged 15 or higher*	6.72	0.29	13.1	3.0	1.3	2.8	107	892	8.3
OLD	*Share of Population above 65 years*	0.07	0.014	0.24	0.05	0.01	0.05	116	949	8.2
MEMPsh	*Manufacturing Share in Total Employment*	0.14	0.00	0.44	0.08	0.03	0.07	117	958	8.2
HTsh	*High-Tech industries share in Manufacturing Employment*	0.23	0.00	0.67	0.13	0.04	0.13	112	772	6.9
MTsh	*Medium-Tech industries share in Manufacturing Employment*	0.21	0.03	0.54	0.07	0.03	0.07	112	772	6.9
LTsh	*Low-Tech industries share in Manufacturing Employment*	0.56	0.16	0.94	0.17	0.05	0.16	112	772	6.9

Note: N indicates the number of countries; Obs. indicates the number of country-period observations; and Tbar indicates the average number of periods covered.

The table summarizes some key descriptive statistics from the variables of the constructed dataset. Looking at the last set of columns, we see that the availability of data varies quite drastically across variables. The number of countries covered is relatively homogeneous (ranging from 80 to 117 countries), but the time coverage in some variables is much more restricted than in others. This is the case, for example, of the NPR, which does not even reach 500 observations. These differences are well reflected in the last column of the table (Tbar), which indicates the average number of 5-year periods covered by each variable. Our dependent variables (EI, NPR, HDI and IID) are typically those with the shortest coverage, hence the panel analysis will to some extent be restricted due to the availability of data on social inclusiveness indicators.

Moving to the specific characteristics of each variable, we observe that the between-variation (that is, the variation between countries) is much larger than the within-variation (that is, the variation along time) in all variables. Hence, when estimating Models (1) and (2), it is important to use an estimator that can account for this type of variation. Given this characteristic of our dataset, fixed-effect type estimators are of little use since they rely on a transformation that completely ignores the between-variation[18]. For this reason, the Hausman-Taylor (HT) estimator is our preferred estimator, which has the advantage of utilizing both within- and between-variation while correcting for endogeneity problems.

Applying the HT estimator requires the potential endogenous regressors to be identified in advance. In order to do so, we follow an approach proposed by Jacob and Osang (2007) and used in Lavopa and Szirmai (2015) and Szirmai and Verspagen (2015). This approach entails running individual regressions of our dependent variables against each explanatory variable using fixed and random effects and then performing a Hausman (1978) test to determine whether the hypothesis that the random effects estimator is consistent and efficient fails to be rejected. If this hypothesis cannot be rejected, then the fixed-effect model will be preferred, indicating evidence of a correlation between the explanatory variable being tested and the residual (endogeneity). The following table summarizes the results of these tests:

[18] See Durlauf et al. (2005) for a discussion on the trade-offs between robustness and efficiency when using fixed-effects in empirical growth models.

Table 2 Results of Hausman's (1978) specification test for the explanatory variables

	Dependent variable			
Variable	**NPR**	**HDI**	**EI**	**IID**
CLIMATE				
NNRR				
y	1	1	1	1
OPEN				1
INV	1	1		1
EDU	1	1	1	1
OLD	1		1	1
MEMPsh	1	1	1	1
HTsh	1	1		1
MTsh	1	1		1
LTsh	1	1		1

Note: The variables for which the Hausman test cannot be rejected at 95 per cent of confidence are indicated with a 1. These variables will be treated as endogenous when applying the HT estimator.

According to these tests, *y*, *EDU* and *MEMPsh* should be taken as endogenous for all dependent variables. The other regressors are endogenous for some dependent variables and not for others.

One last important feature we should look at before implementing our econometric approach is related to the distributional characteristics of our explanatory variables. The results of linear regression models are unbiased as long as the variables involved have a normal distribution. If some variables show a highly skewed distribution, the inferences that can be taken from the regressions' results might be biased. In that case, the literature recommends performing some transformation to the corresponding variable in order to achieve a distribution that is as close as possible to a normal distribution. In our case, many of the explanatory variables show a strongly skewed distribution, and we therefore decided to introduce all of them in log form.

3. General trends

Before conducting a detailed econometric analysis of the determinants of our four social inclusiveness indicators, we look at their main trends over the last three decades. More specifically, in this section we briefly summarize the evolution of these indicators between 1980 and 2014 by broad developing region. We consider all countries that were not high-income countries in 1991 as developing countries in accordance with the World Banks's definition. Within this set of countries, we distinguish four groups based on geographical location: Africa (including the Middle East), Asia (excluding the former Soviet republics and the Middle East), Eastern Europe (including the former Soviet republics) and Latin America[19].

3.1 Indicators of social inclusiveness

Figure 1 illustrates the evolution of the four social inclusiveness indicators we examine in this paper. Each panel provides the (unweighted) average of each indicator by developing region between 1980 and 2014. In all cases, the averages are calculated for 5-year periods to maximize the number of observations and minimize the potential effect of extreme years.

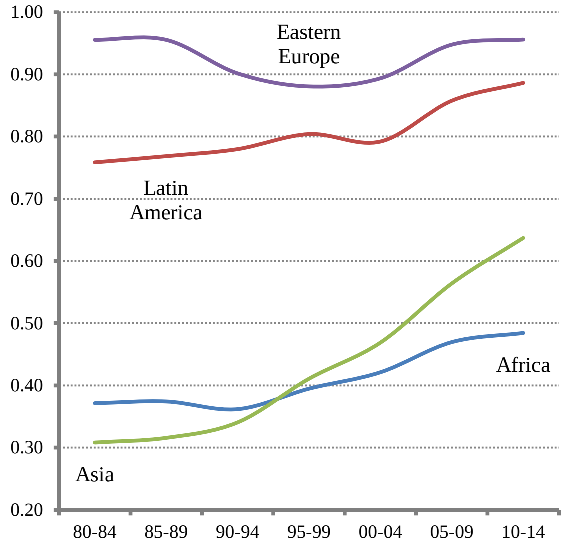
To begin with, it is important to note that the levels of indicators are quite different across developing regions. In terms of poverty and human development, Eastern Europe and Latin America fare far better than Asia and Africa. The difference to the former, however, has been narrowing over time. As regards distribution, Latin America as a region ranks worst both in terms of overall economy (EI) and in terms of manufacturing (IID). Eastern Europe is the most equal region, although it shows the worst trend over time.

Looking at the dynamics in general, we observe a positive trend in most indicators/regions, showing important improvements in terms of social inclusiveness in the last 35 years. These achievements, however, vary by region and indicator. As expected, Asia achieved the best performance in terms of poverty and human development, with an impressive increase of the NPR and HDI, especially after 1995. The outcome in terms of income distribution (as captured by the EI and the IID), however, is not so positive. The EI, in fact, decreased between the end points of the period, while the IID was almost at the same level. Africa also made very important improvements in terms of poverty, human development and overall income distribution. The three indicators rose significantly between 1980 and 2014. The IID, instead, dropped dramatically, suggesting a weak inclusive industrialization process. Latin America also made important achievements in terms of poverty reduction and improved income distribution, especially from 2000 onwards. HDI increased steadily over the entire period.

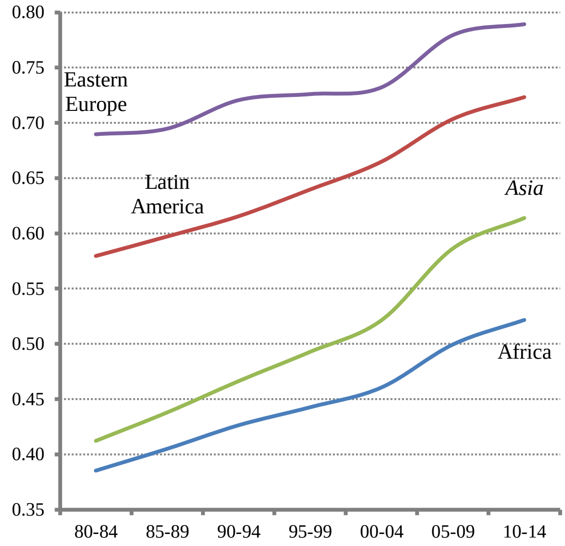
[19] See Table 5 in the Appendix for a detailed list of the countries included in each region.

Figure 1 Main trends in social inclusiveness indicators by developing region, 5-year averages, 1980-2014

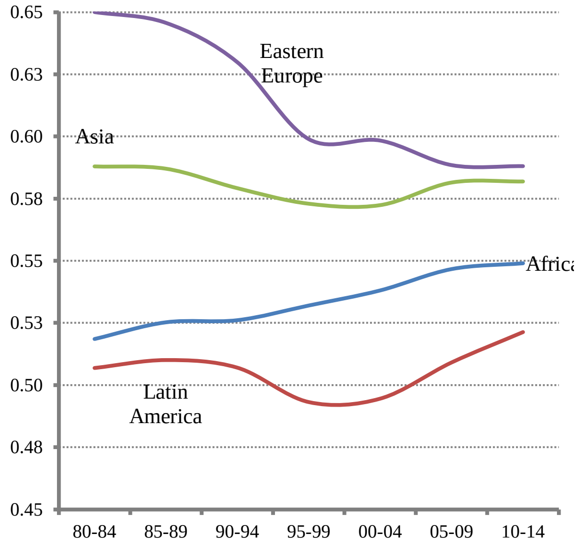
a. Non-Poor Ratio (NPR)



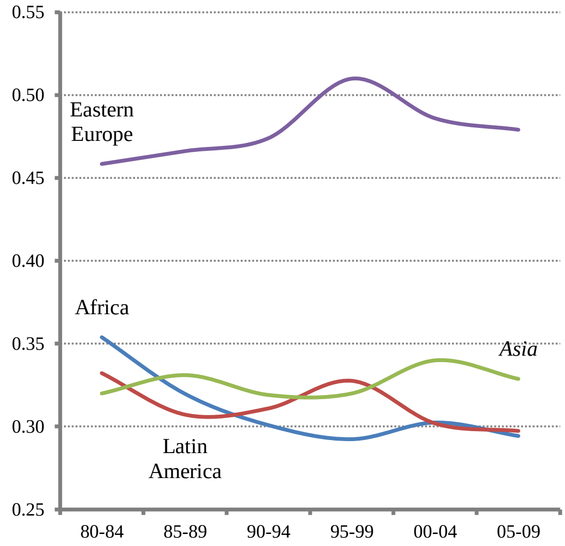
b. Human Development Index (HDI)



c. Equity Index (EI)



d. Inclusive Industrial Development (IID)

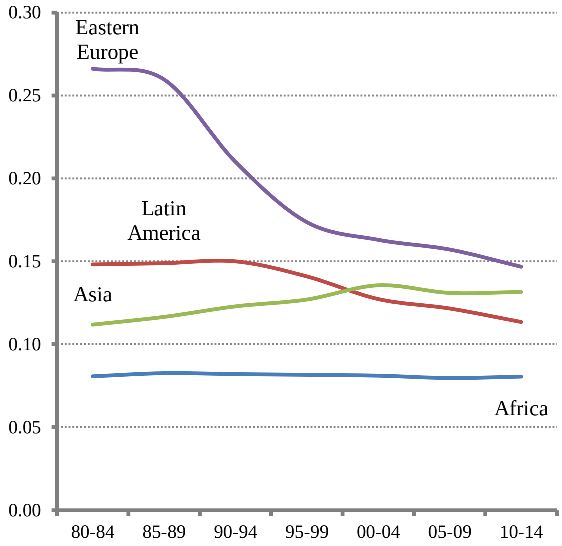


Note: regional values calculated as unweighted averages over countries with available data for the entire period.

3.2 Manufacturing

Since our main focus is on the role of structural change towards manufacturing in driving these trends, we look at the broad trends in the manufacturing shares in each of these regions during the same period. Figure 2 presents the details.

Figure 2 **Share of manufacturing in total employment by developing region. 5-year averages, 1980-2014**

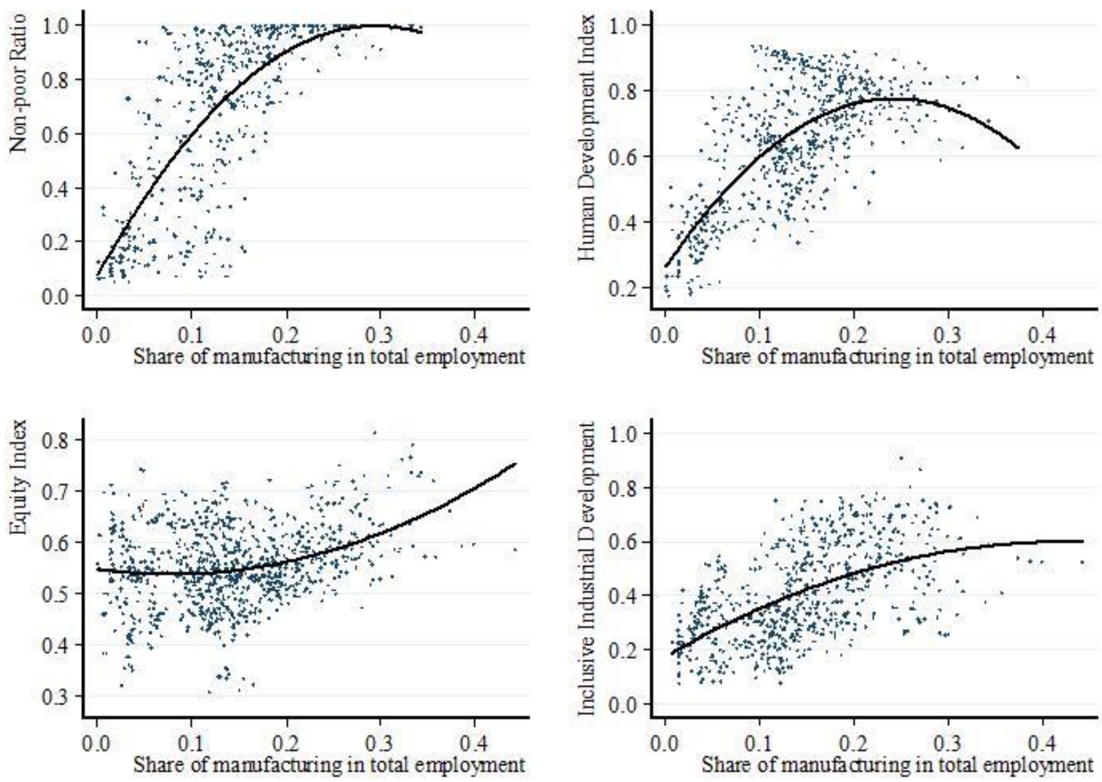


Note: Regional shares are calculated as unweighted averages of countries with available data for the entire period.

The share of manufacturing in total employment also reveals contrasting dynamics between developing regions. These dynamics are in line with the general patterns of structural change typically observed as countries get richer (see, for example, Haraguchi and Rezonja (2011); UNIDO (2013)). The wealthier sets of countries (Latin America and Eastern Europe) show a clear steady decline. In Asia, instead, we observe an important increase until the early 2000s. The share then stabilizes at about 14 per cent of total employment. Perhaps more surprisingly is the average trend observed in Africa, where the manufacturing share remained almost unchanged at a very low level (less than 10 per cent) during the entire period. In this case, however, we should keep in mind that this aggregate includes countries with very different characteristics. The richer and more developed countries of North Africa and the Middle East have a larger share that declined over the period, while sub-Saharan African countries have a lower share that increased (though only marginally) during the period.

Finally, it is interesting to look at the relationship between each social inclusiveness indicator and the share of manufacturing in total employment. To have sufficient variability across countries, we look at the entire sample (including advanced economies). The following figures present the corresponding scatter plots. Each point represents a five-year average value for each country of our sample between 1970 and 2014. Due to lack of data, not all countries are covered throughout the entire period, so the panel used is unbalanced.

Figure 3 **Relationship between social inclusiveness indicators and industrialization, 5-year averages, 1970-2014**



Interestingly, the basic correlations shown in this figure suggest a positive relationship between the share of manufacturing in total employment and each of our social inclusiveness indicators. In all cases except EI, this relationship seems to decrease with the share of manufacturing; only in the case of HDI does it reach a turning point within the relevant range of manufacturing share. These basic correlations thus provide some preliminary evidence on the positive role of manufacturing in driving social inclusiveness. They might, however, be indicative of other factors that also influence the level of social inclusiveness and at the same time, are highly correlated with the share of manufacturing. A clear example would be the country's income level. As is well documented, wealthy countries tend to have larger shares of manufacturing than very poor countries. Their social inclusiveness indicators, at the same time, are much better than those corresponding to poor countries. The positive relationship observed in Figure 3 could hence merely be reflecting this simple fact. A more solid analysis that controls for the effects of other variables is therefore necessary. With this purpose in mind, we now turn to the econometric analysis of the determinants of our social inclusiveness indicators.

4. Results

In this section, we present the results of the econometric estimations of Models (1) and (2). As previously mentioned, our preferred estimator is the Hausman-Taylor (HT). Hence, all results refer to that estimator. The results using other estimators (fixed-effects, random-effects and between estimator) can be found in the Appendix.

Table 3 presents the results for Model 1, i.e. the determinants of each of our social inclusiveness indicators without distinction by industry group.

Table 3 Determinants of social inclusiveness: The role of manufacturing. Hausman-Taylor estimator, 5-year averages, 1970-2014

	NPR	**HDI**	**EI**	**IID**
Constant	-1.269*	1.005***	-0.008	0.500
CLIMATE	0.035	0.029	-0.015	0.023
NNRR	0.049	0.048*	-0.002	0.035
Ln(y)	0.544***		0.124**	0.125
$Ln(y)^2$	-0.028***		-0.008***	-0.008
Ln(OPEN)	0.029***	0.000	-0.009**	0.027***
Ln(INV)	0.040**	0.014***	-0.002	-0.015
Ln(EDU)	0.063		0.045***	-0.031
Ln(OLD)	0.195***	0.076***	-0.029*	0.091**
Ln(MEMPsh)	0.038**	0.023***	0.014*	0.029*
Europe (adv.)	0.000	-0.042	0.015	-0.053
Asia (adv.)	0.000	0.008	0.004	-0.149*
Africa	0.051	-0.256***	-0.044	-0.222**
Latin America	0.126*	-0.122*	-0.102	-0.280***
Asia (dev.)	-0.109	-0.217***	-0.017	-0.264**
Europe (dev.)	0.000	-0.122*	0.014	-0.160*
Oceania (dev.)				
d77	0.000	0.000	0.000	0.014
d82	0.003	-0.020***	0.008	0.012
d87	0.000	0.000	0.005	-0.012
d92	-0.028*	0.021***	-0.005	-0.018
d97	-0.048**	0.037***	-0.018	-0.024
d02	-0.062**	0.054***	-0.018	-0.028
d07	-0.041	0.089***	-0.011	-0.039
d12	-0.031	0.105***	-0.009	0.000
Rho	0.799	0.921	0.740	0.639
Obs.	434	577	798	644
Countries	69	89	97	95

* p<0.05, ** p<0.01, *** p<0.001

Interestingly, the only explanatory variable that is positive and highly significant across all indicators of social inclusiveness is the share of manufacturing in total employment (MEMPsh). This means that after controlling for other effects that may also influence the level of social inclusiveness, the share of manufacturing continues to play an important role in driving poverty reduction, human development and income equity. The remaining regressors have various impacts across the different indicators of inclusiveness. Income level has a positive and highly significant effect on poverty reduction (NPR) and income equity (EI). This effect seems to decrease, as suggested by the negative coefficient associated with the square terms of income. According to our regression results, openness (OPEN) has a positive impact on poverty reduction and inclusive industrialization, but it also has a negative impact on income equity. A similar trend is observable as regards age structure (OLD): societies with a larger share of old people tend to be more unequal, but have higher levels of IID, HDI and lower poverty rates. Investments in physical capital (INV) have positive effects on poverty reduction and human development. Finally, education (EDU) seems to have a significant (and positive) effect only in terms of the income equality of countries. CLIMATE and NNRR do not seem to have a significant impact according to our regression results, except in the case of HDI, where the coefficient associated with NNRR shows a highly significant positive effect.

The regional dummies also reveal some interesting patterns. Africa and Asia tend to have lower levels of HDI and IID, while Latin America's income distribution tends to be the worst.

Overall, we can conclude that structural change towards manufacturing tends to have a positive impact on the social inclusiveness of countries, regardless of the indicator used to measure inclusiveness. This impact is statistically significant and occurs even after controlling for other dimensions that might also influence the levels of social inclusiveness, such as income, openness and human capital.

We now explore whether specific industries within manufacturing are better suited to drive this positive outcome. As mentioned earlier, we are particularly interested in looking at groups of industries with different levels of technological content. Hence, we expand Model (1) to include an additional variable to capture the industrial composition of the manufacturing sector. The measure used is the share of workers in high-, medium- and low-tech industries. The Appendix lists the results for each industry group and each indicator. Here, we only present the results of the high-tech industry group, which provides a rough indication of the manufacturing sector's level of sophistication.

Table 4 Determinants of social inclusiveness: The role of high-tech industries. Hausman-Taylor estimator, 5-year averages, 1970-2014

	NPR	HDI	EI	IID
Constant	-1.944**	0.000	-0.058	0.069
CLIMATE	0.045	0.025	-0.021	0.012
NNRR	0.046	0.048*	-0.005	0.039
Ln(y)	0.719***	0.000	0.124**	0.253**
$Ln(y)^2$	-0.040***	0.000	-0.009**	-0.015**
Ln(OPEN)	0.031*	0.000	-0.017***	0.026**
Ln(INV)	0.025	0.015**	0.000	-0.026*
Ln(EDU)	0.037	0.000	0.063***	-0.074**
Ln(OLD)	0.138**	0.056***	-0.037*	0.121***
Ln(MEMPsh)	0.088***	0.026***	0.019*	0.030
HTsh	0.150	0.135***	0.124***	0.068
Europe (adv.)	0.000	-0.043	0.022	-0.069
Asia (adv.)	0.000	0.001	0.009	-0.146
Africa	0.000	-0.233***	-0.034	-0.212*
Latin America	0.076	-0.108	-0.091	-0.285***
Asia (dev.)	-0.188***	-0.213***	-0.009	-0.263**
Europe (dev.)	-0.033	-0.110	0.019	-0.162
Oceania (dev.)				
d77	0.000	0.000	-0.001	0.020
d82	-0.003	0.897***	-0.001	0.023
d87	0.000	0.919***	-0.004	-0.001
d92	-0.015	0.941***	-0.012	-0.011
d97	-0.028	0.962***	-0.022*	-0.013
d02	-0.027	0.985***	-0.017	-0.019
d07	0.014	1.019***	-0.012	-0.025
d12	0.038	1.030***	-0.016	0.000
Rho	0.847	0.936	0.811	0.698
Obs.	343	474	673	587
Countries	68	85	96	95

* p<0.05, ** p<0.01, *** p<0.001

As we can see in Table 4, the larger the share of high-tech industries (HTsh) in total manufacturing employment, the better the results in terms of social inclusiveness. In all cases, the coefficient associated with this variable is positive. However, this coefficient is statistically significant only in the case of human development (HDI) and income equity (EI). This implies that the composition of manufacturing is particularly important for these two indices. In the other indicators of social inclusiveness, the size of manufacturing is the most important, regardless of the specific composition. Another interesting finding of this set of regressions is that medium-tech industries are negatively associated with all our social inclusiveness indicators, with highly significant coefficients in the cases of HDI and IID (see Table 10 in the Appendix). Since most resource-intensive industries (such as *Refined Petroleum*, *Rubber and Plastics*, *Non-metallic Minerals* and *Basic Metals*) are included in the medium-tech group, this could reflect some sort of natural resource curse according to which a specialization in this type of industry has a negative impact on the level of human development and the degree of industrial inclusiveness.

Taken together, Table 3 and Table 4 provide interesting insights on the role of structural change (broadly defined as the movement of labour towards manufacturing industries and the changes that take place within them) in driving social inclusiveness. The main conclusion that can be drawn from our regression results is that the expansion of manufacturing industries is positively and highly significantly correlated with the level of social inclusiveness of modern societies in terms of poverty reduction, human development and income equality. Moreover, it seems that not all types of industry deliver the same results: high-tech industries are particularly important in achieving this positive outcome. Given a certain size of manufacturing, an industrial composition that is more oriented towards high-tech industries will tend to be associated with higher levels of human development and better income distribution. By contrast, a sectoral composition more inclined towards medium-tech industries will tend to have a negative impact on human development and our index of inclusive industrial development.

5. Conclusions and future research

In this paper, we have explored the role of structural change in driving social inclusiveness. Structural change has been broadly defined as the shift of labour towards manufacturing industries. Social inclusiveness, in turn, has been approximated by looking at four different indicators: Non-Poverty Ratio (NPR), Human Development Index (HDI), Equity Index (EI) and Inclusive Industrial Development index (IID). The relationship between structural change and these indicators has been examined using panel-data techniques on a newly constructed dataset that provides information for nearly 100 countries over the period 1970-2014.

Our results show a positive and highly significant effect of manufacturing on each of these indicators. Even after controlling for several other variables that can affect the level of a country's social inclusiveness (such as income, education and openness), the share of manufacturing has a positive effect on poverty reduction, human development and income equity. However, not all industries seem to have the same impact in terms of inclusiveness. According to our results, it is mainly high-tech industries that drive this positive development.

Medium-tech industries instead (mainly associated with natural –resource-intensive industries), are typically negatively associated with social inclusiveness, in line with the so-called natural resource curse.

This analysis should be taken as a first step in an explorative examination of this relationship. Like many econometric studies, our results might be biased due to endogeneity problems. Even though we have attempted to address this problem by using specific techniques aimed at minimizing this effect, we are aware of the limitations our estimators have. In future research, we aim to use more sophisticated techniques, such as the GMM estimators, to resolve this issue. Moreover, our classification of industries by technological content is quite rough and does not take into account the important heterogeneities that are also present within the broad groups defined here. In future research, we also aim to improve this classification by using more disaggregated data and some measure of distance to the technological frontier to account for the upgrading within sectors with similar technological content.

References

Acar, S., and Dogruel, F. (2012). Sources of inequality in selected MENA countries. *Structural Change and Economic Dynamics*, *23*(3), 276–285.

Alderson, A., and Nielsen, F. (2002). Globalization and the Great U -Turn : Income Inequality Trends in 16 OECD Countries. *American Journal of Sociology*, *107*(5), 1244–1299.

Barro, R. J., and Lee, J. W. (2013). A new data set of educational attainment in the world, 1950–2010. *Journal of Development Economics*, *104*, 184–198.

Chun, N., Hasan, R., and Kumar, U. (2012). Manufacturing Dynamism and the Welfare of Workers and Households in India. *Asian Development Bank*.

Durlauf, S., Johnson, P. A., and Temple, J. (2005). Growth econometrics. In P. Aghion & S. Durlauf (Eds.), *Handbook of economic growth* (pp. 555–677). North-Holland.

Fagerberg, J., and Verspagen, B. (1999). "Modern Capitalism" in the 1970s and 1980s. *Working Papers Archives*, *1999002*.

Fagerberg, J., and Verspagen, B. (2002). Technology-gaps, innovation-diffusion and transformation: an evolutionary interpretation. *Research Policy*, *31*(8-9), 1291–1304.

Feenstra, R. C., Inklaar, R., and Timmer, M. (2015). The Next Generation of the Penn World Table. *American Economic Review*, *Forthcomin*.

Felipe, J. (1998). The role of the manufacturing sector in Southeast Asian development: a test of Kaldor's first law. *Journal of Post Keynesian Economics*, *20*(3), 463–485.

Galbraith, J., Halbach, B., Malinowska, A., Shams, A., and Zhang, W. (2014). The UTIP Global Inequality Data Sets 1963-2008. Updates, Revisions and Quality Checks. *UTIP Working Paper*, *68*(May).

Galbraith, J., and Kum, H. (2005). Estimating the inequality of household incomes: A statistical approach to the creation of a dense and consistent global data set. *Review of Income and Wealth*, *51*, 115–43.

Gallup, J. L., Sachs, J. D., and Mellinger, a. D. (1999). Geography and Economic Development. *International Regional Science Review*, *22*(2), 179–232.

Haraguchi, N., and Rezonja, G. (2011). Emerging patterns of manufacturing structural change. *UNU-WIDER Working Paper*, *2011/43*(August), 28.

Hasan, R., and Quibria, M. (2004). Industry matters for poverty: A critique of agricultural fundamentalism. *Kyklos*, *57*(April), 253–264.

Hatzichronoglou, T. (1997). Revision of the high-technology sector and product classification. *OECD Science, Technology and Industry Working Papers*, *1997/02*.

Hausman, J. (1978). Specification tests in econometrics. *Econometrica: Journal of the Econometric Society*, *46*(6), 1251–1271.

Jacob, J., and Osang, T. (2007). Institutions , Geography and Trade : A Panel Data Study 1. *Association Meetings*, (214).

Kum, H. (2010). Cross-Country Variability in Inequality Change. *The Korean Journal of Policy Studies*, *25*(1), 1–17.

Lavopa, A. (2015). Structural Transformation and Economic Development. Can Development Traps be Avoided? *PhD Thesis, Maastricht University*.

Lavopa, A., and Szirmai, A. (2012). Industrialization, employment and poverty. *UNU-MERIT Working Paper Series, 081*.

Lavopa, A., and Szirmai, A. (2015). Drivers of Structural Modernisation. The role of Manufacturing Industries. *UNU-MERIT Working Paper Series*, *Forthcomin*.

Li, S., and Luo, C. (2008). Growth pattern, employment, and income inequality: What the experience of Republic of Korea and Taipei, China Reveals to the People's Republic of China. *Asian Development Review*, *25*(1-2), 100–118.

Mamgain, V. (1999). Are the Kaldor-Verdoorn Laws Applicable in the Newly Industrializing Countries? *Review of Development Economics*, *3*(3), 295–309.

Necmi, S. (1999). Kaldor ' s growth analysis revisited. *Applied Economics*, *31*(5), 653–660.

OECD. (2003). *Science, Technology and Industry Scoreboard 2003*. Paris: OECD Publishing.

Rodrik, D. (2009). Growth after the Crisis. *CEPR Discussion Paper*, *7480*, 1–46.

Solt, F. (2009). Using the Standardized World Income Inequality Database, 1–6.

Szirmai, A. (2011). Industrialisation as an engine of growth in developing countries, 1950–2005. *Structural Change and Economic Dynamics*.

Szirmai, A., Naudé, W., and Alcorta, L. (2013). Introduction and Overview: The Past, Present and Future of Industrialization. In A. Szirmai, W. Naudé, & L. Alcorta (Eds.), *Pathways to Industrialization in the Twenty-First Century: New Challenges and Emerging Paradigms* (pp. 1–63). UNU-WIDER and Oxford University Press.

Szirmai, A., and Verspagen, B. (2015). Manufacturing and Economic Growth in Developing Countries, 1950-2005. *Structural Change and Economic Dynamics*, *34*, 46–59.

Timmer, M., Dietzenbacher, E., Los, B., Stehrer, R., and de Vries, G. (2015). An Illustrated User Guide to the World Input–Output Database: the Case of Global Automotive Production. *Review of International Economics*, *doi 10.111*.

UNIDO. (2013). *Industrial Development Report 2013 Sustaining Employment Growth: The Role of Manufacturing and Structural Change*. Vienna: UNIDO.

Wells, H., and Thirlwall, A. P. (2003). Testing Kaldor's growth laws across the countries of Africa. *African Development Review*, *15*(2-3), 1–17.

World Bank. (2010). *The Changing Wealth of Nations. Measuring Sustainable Development in the New Millennium*. Washington DC: The World Bank.

Appendix 1 List of countries

Table 5 List of countries and period coverage by region and indicator

Region/Country	ID	Coverage			
		NPR	HDI	EI	IID
World	W				
Advanced	1				
Americas	11				
Canada	CAN		1980-2014	1980-2014	1980-2009
United States	USA		1980-2014	1980-2014	1980-2009
Europe	12				
Austria	AUT			1980-2014	1980-2009
Belgium	BEL		1980-2014	1980-2014	1980-2009
Switzerland	CHE		1980-2014	1980-2014	
Germany	DEU		1980-2014	1980-2014	1980-2009
Denmark	DNK		1980-2014	1980-2014	1980-2009
Spain	ESP		1980-2014	1980-2014	1980-2009
Finland	FIN			1980-2014	1980-2009
France	FRA		1980-2014	1980-2014	1980-2009
United Kingdom	GBR		1980-2014	1980-2014	1980-2009
Ireland	IRL		1980-2014	1980-2014	1980-2009
Iceland	ISL				1980-2009
Italy	ITA		1980-2014	1980-2014	1980-2009
Luxembourg	LUX			1980-2014	1980-2009
Netherlands	NLD		1980-2014	1980-2014	1980-2009
Norway	NOR		1980-2014	1980-2014	1980-2009
Sweden	SWE		1980-2014	1980-2014	1980-2009
Asia and Oceania	13				
Australia	AUS		1980-2014	1980-2014	1980-2009
Brunei Darussalam	BRN				
Cyprus	CYP		1980-2014		1980-2009
Hong Kong	HKG			1980-2014	1980-2009
Israel	ISR		1980-2014	1980-2014	1980-2009
Japan	JPN		1980-2014	1980-2014	1980-2009
Kuwait	KWT		1980-2014		1980-2009
New Zealand	NZL		1980-2014	1980-2014	1980-2009
Qatar	QAT		1980-2014		1980-2009
Singapore	SGP		1980-2014	1980-2014	1980-2009
Taiwan	TWN			1980-2014	1980-2009

Region/Country	ID	Coverage			
		NPR	HDI	EI	IID
Developing	**2**				
Africa	21				
North Africa and ME	211				
Bahrain	BHR		1980-2014		
Egypt	EGY	1980-2014	1980-2014	1980-2014	1980-2009
Iraq	IRQ				
Jordan	JOR	1980-2014	1980-2014	1980-2014	1980-2009
Lebanon	LBN			1980-2014	
Morocco	MAR	1980-2014	1980-2014	1980-2014	1980-2009
Oman	OMN				1980-2009
Saudi Arabia	SAU		1980-2014		
Sudan	SDN		1980-2014	1980-2014	
Syrian Arab Republic	SYR		1980-2014	1980-2014	1980-2009
Tunisia	TUN	1980-2014	1980-2014	1980-2014	1980-2009
Turkey	TUR	1980-2014	1980-2014	1980-2014	1980-2009
Yemen	YEM		1980-2014		1980-2009
Sub-Saharan Africa	212				
Angola	AGO			1980-2014	
Burundi	BDI	1980-2014		1980-2014	1980-2009
Benin	BEN		1980-2014	1980-2014	
Burkina Faso	BFA	1980-2014		1980-2014	
Botswana	BWA	1980-2014	1980-2014	1980-2014	1980-2009
Central African Rep.	CAF	1980-2014	1980-2014	1980-2014	1980-2009
Côte d'Ivoire	CIV	1980-2014	1980-2014	1980-2014	1980-2009
Cameroon	CMR		1980-2014	1980-2014	1980-2009
Congo	COG		1980-2014		1980-2009
Comoros	COM			1980-2014	
Cabo Verde	CPV			1980-2014	
Djibouti	DJI			1980-2014	
Ethiopia	ETH			1980-2014	1980-2009
Gabon	GAB		1980-2014	1980-2014	1980-2009
Ghana	GHA	1980-2014	1980-2014	1980-2014	1980-2009
Guinea	GIN			1980-2014	
Gambia	GMB		1980-2014	1980-2014	
Guinea-Bissau	GNB			1980-2014	
Equatorial Guinea	GNQ				
Kenya	KEN	1980-2014	1980-2014	1980-2014	1980-2009
Liberia	LBR		1980-2014		
Lesotho	LSO		1980-2014	1980-2014	1980-2009
Madagascar	MDG			1980-2014	1980-2009

Region/Country	ID	Coverage			
		NPR	HDI	EI	IID
Mali	MLI	1980-2014	1980-2014	1980-2014	
Mozambique	MOZ		1980-2014	1980-2014	1980-2009
Mauritania	MRT	1980-2014	1980-2014	1980-2014	
Mauritius	MUS		1980-2014	1980-2014	1980-2009
Malawi	MWI		1980-2014	1980-2014	1980-2009
Namibia	NAM	1980-2014	1980-2014	1980-2014	
Niger	NER	1980-2014	1980-2014	1980-2014	
Nigeria	NGA			1980-2014	1980-2009
Rwanda	RWA	1980-2014	1980-2014	1980-2014	1980-2009
Senegal	SEN	1980-2014	1980-2014	1980-2014	1980-2009
Sierra Leone	SLE		1980-2014	1980-2014	
Sao Tome & Principe	STP				
Swaziland	SWZ	1980-2014		1980-2014	1980-2009
Chad	TCD			1980-2014	
Togo	TGO		1980-2014		
Tanzania	TZA	1980-2014	1980-2014	1980-2014	1980-2009
Uganda	UGA	1980-2014	1980-2014	1980-2014	1980-2009
South Africa	ZAF	1980-2014	1980-2014	1980-2014	1980-2009
D.R. of the Congo	ZAR				
Zambia	ZMB	1980-2014	1980-2014	1980-2014	1980-2009
Zimbabwe	ZWE		1980-2014	1980-2014	
Americas	22				
North America	221				
Mexico	MEX	1980-2014	1980-2014	1980-2014	1980-2009
C. America & Carib.	222				
Costa Rica	CRI	1980-2014	1980-2014	1980-2014	1980-2009
South America	223				
Argentina	ARG	1980-2014	1980-2014	1980-2014	1980-2009
Bolivia	BOL	1980-2014		1980-2014	1980-2009
Brazil	BRA	1980-2014		1980-2014	
Chile	CHL	1980-2014	1980-2014	1980-2014	1980-2009
Colombia	COL	1980-2014	1980-2014	1980-2014	1980-2009
Ecuador	ECU	1980-2014	1980-2014	1980-2014	1980-2009
Peru	PER	1980-2014	1980-2014	1980-2014	1980-2009
Paraguay	PRY		1980-2014	1980-2014	1980-2009
Uruguay	URY	1980-2014	1980-2014	1980-2014	1980-2009
Venezuela	VEN	1980-2014	1980-2014	1980-2014	1980-2009

Region/Country	ID	Coverage			
		NPR	HDI	EI	IID
Asia (exc. FSU)	23				
Eastern Asia	231				
China	CHN	1980-2014	1980-2014	1980-2014	
Republic of Korea	KOR		1980-2014		1980-2009
Macao	MAC				1980-2009
Mongolia	MNG		1980-2014	1980-2014	1980-2009
South-Eastern Asia	232				
Indonesia	IDN	1980-2014		1980-2014	1980-2009
Cambodia	KHM	1980-2014		1980-2014	
Lao People's DR	LAO	1980-2014		1980-2014	
Malaysia	MYS	1980-2014		1980-2014	1980-2009
Philippines	PHL	1980-2014		1980-2014	1980-2009
Thailand	THA	1980-2014	1980-2014	1980-2014	1980-2009
Viet Nam	VNM	1980-2014	1980-2014	1980-2014	
Southern Asia	233				
Bangladesh	BGD	1980-2014		1980-2014	1980-2009
Bhutan	BTN			1980-2014	
India	IND	1980-2014	1980-2014	1980-2014	1980-2009
Iran	IRN	1980-2014	1980-2014	1980-2014	1980-2009
Sri Lanka	LKA	1980-2014	1980-2014	1980-2014	1980-2009
Maldives	MDV			1980-2014	
Nepal	NPL	1980-2014	1980-2014	1980-2014	1980-2009
Pakistan	PAK	1980-2014	1980-2014	1980-2014	1980-2009
Europe	24				
Western Europe	241				
Greece	GRC		1980-2014	1980-2014	1980-2009
Malta	MLT			1980-2014	1980-2009
Portugal	PRT		1980-2014	1980-2014	1980-2009

Region/Country	ID	Coverage			
		NPR	HDI	EI	IID
Eastern Europe	242				
Albania	ALB	1980-2014	1980-2014	1980-2014	1980-2009
Bulgaria	BGR	1980-2014		1980-2014	1990-2009
Bosnia & Herzegov.	BIH	1980-2014		1990-2014	
Czech Republic	CZE	1980-2014	1990-2014	1990-2014	1990-2009
Czechoslovakia	CZE_f				
Croatia	HRV	1980-2014	1980-2014	1990-2014	1990-2009
Hungary	HUN	1980-2014	1980-2014	1980-2014	1980-2009
Macedonia	MKD	1980-2014		1990-2014	1990-2009
Montenegro	MNE			1990-2014	
Poland	POL	1980-2014	1990-2014	1980-2014	1990-2009
Romania	ROM	1980-2014	1980-2014	1980-2014	1985-2009
Serbia	SRB	1980-2014	1990-2014	1990-2014	
Slovakia	SVK	1980-2014	1980-2014	1990-2014	1990-2009
Slovenia	SVN		1990-2014	1990-2014	1990-2009
Yugoslavia	YUG				
Former Soviet Union	243				
Armenia	ARM	1990-2014	1980-2014	1990-2014	1990-2009
Azerbaijan	AZE			1990-2014	1990-2009
Belarus	BLR	1980-2014		1990-2014	
Estonia	EST	1980-2014	1980-2014	1990-2014	1990-2009
Georgia	GEO	1990-2014		1990-2014	1990-2009
Kazakhstan	KAZ	1980-2014		1990-2014	1990-2009
Kyrgyzstan	KGZ	1990-2014		1990-2014	1990-2009
Lithuania	LTU	1980-2014		1990-2014	1990-2009
Latvia	LVA	1980-2014	1980-2014	1990-2014	1990-2009
Rep. of Moldova	MDA	1980-2014	1980-2014	1990-2014	1990-2009
Russian Federation	RUS	1980-2014	1980-2014	1990-2014	1990-2009
Tajikistan	TJK		1980-2014	1990-2014	
Ukraine	UKR	1980-2014	1980-2014	1990-2014	1990-2009
USSR	USSR				
Oceania	25				
Fiji	FJI	1990-2014		1980-2014	1980-2009

Appendix 2 Econometric results by estimator

Table 6 Determinants of the Non-Poor Rate (NPR): The role of manufacturing Different estimators, 5-year averages, 1970-2014

	Random Effects	Fixed Effects	Between	Hausman-Taylor
Constant	-1.203	-1.410	-0.505	-1.269*
CLIMATE	0.033	0.000	0.032	0.035
NNRR	0.044	0.000	0.037	0.049
Ln(y)	0.503**	0.601**	0.339	0.544***
$Ln(y)^2$	-0.025*	-0.032**	-0.014	-0.028***
Ln(OPEN)	0.033*	0.018	0.086**	0.029***
Ln(INV)	0.039*	0.045*	0.057	0.040**
Ln(EDU)	0.060	0.029	0.031	0.063
Ln(OLD)	0.176**	0.187*	0.106	0.195***
Ln(MEMPsh)	0.043*	0.033	0.087*	0.038**
Europe (adv.)	0.000	0.000	0.000	0.000
Asia (adv.)	0.000	0.000	0.000	0.000
Africa	0.041	0.000	-0.039	0.051
Latin America	0.117*	0.000	0.030	0.126*
Asia (dev.)	-0.116	0.000	-0.177*	-0.109
Europe (dev.)	0.000	0.000	0.000	0.000
Oceania (dev.)	0.000	0.000	0.000	
d77	0.000	0.000	0.000	0.000
d82	0.035	-0.001	0.446	0.003
d87	0.034	0.000	0.000	0.000
d92	0.005	-0.019	-0.369	-0.028*
d97	-0.015	-0.032	-0.151	-0.048**
d02	-0.028	-0.040	0.255	-0.062**
d07	-0.009	-0.009	0.536	-0.041
d12	0.000	0.005	-0.533	-0.031
Rho	0.736	0.847		0.799
Obs.	434	434	434	434
Countries	69	69	69	69

* p<0.05, ** p<0.01, *** p<0.001

Table 7 Determinants of the Human Development Index (HDI): The role of manufacturing. Different estimators, 5-year averages, 1970-2014

	Random Effects	Fixed Effects	Between	Hausman-Taylor
Constant	1.130***	0.950***	1.257***	1.005***
CLIMATE	0.027	0.000	0.015	0.029
NNRR	0.049*	0.000	0.049*	0.048*
Ln(y)				
Ln(y)^2				
Ln(OPEN)	0.001	-0.002	0.027*	0.000
Ln(INV)	0.014	0.014	0.071**	0.014***
Ln(EDU)				
Ln(OLD)	0.081***	0.066**	0.064*	0.076***
Ln(MEMPsh)	0.028***	0.021***	0.071***	0.023***
Europe (adv.)	-0.044*	0.000	-0.071	-0.042
Asia (adv.)	0.010	0.000	-0.033	0.008
Africa	-0.244***	0.000	-0.189**	-0.256***
Latin America	-0.118***	0.000	-0.120*	-0.122*
Asia (dev.)	-0.209***	0.000	-0.198***	-0.217***
Europe (dev.)	-0.120***	0.000	-0.115*	-0.122*
Oceania (dev.)	0.000	0.000	0.000	
d77	0.000	0.000	0.000	0.000
d82	-0.123***	-0.130***	-0.153	-0.020***
d87	-0.103***	-0.110***	0.000	0.000
d92	-0.082***	-0.087***	0.000	0.021***
d97	-0.067***	-0.070***	0.000	0.037***
d02	-0.051***	-0.053***	0.061	0.054***
d07	-0.016***	-0.016***	-0.070	0.089***
d12	0.000	0.000	0.000	0.105***
Rho	0.877	0.973		0.921
Obs.	577	577	577	577
Countries	89	89	89	89

* p<0.05, ** p<0.01, *** p<0.001

Table 8 Determinants of the Equity Index (EI): The role of manufacturing
Different estimators, 5-year averages, 1970-2014

	Random Effects	**Fixed Effects**	**Between**	**Hausman-Taylor**
Constant	0.183	-0.061	1.194	-0.008
CLIMATE	-0.013	0.000	-0.016	-0.015
NNRR	0.000	0.000	0.006	-0.002
Ln(y)	0.112*	0.121*	0.083	0.124**
$Ln(y)^2$	-0.008*	-0.008*	-0.007	-0.008***
Ln(OPEN)	-0.011	-0.007	-0.016	-0.009**
Ln(INV)	0.000	-0.002	-0.004	-0.002
Ln(EDU)	0.021	0.056*	-0.020	0.045***
Ln(OLD)	-0.015	-0.028	0.033	-0.029*
Ln(MEMPsh)	0.019*	0.014	0.027	0.014*
Europe (adv.)	0.005	0.000	-0.013	0.015
Asia (adv.)	0.002	0.000	0.020	0.004
Africa	-0.072	0.000	-0.107	-0.044
Latin America	-0.119***	0.000	-0.132*	-0.102
Asia (dev.)	-0.045	0.000	-0.076	-0.017
Europe (dev.)	-0.004	0.000	-0.032	0.014
Oceania (dev.)	0.000	0.000	0.000	
d77	0.004	-0.002	-1.484	0.000
d82	0.015	0.003	-0.902	0.008
d87	0.015	-0.001	0.000	0.005
d92	0.008	-0.013	-1.405	-0.005
d97	-0.003	-0.028	0.000	-0.018
d02	0.000	-0.030	0.000	-0.018
d07	0.009	-0.025	-1.515	-0.011
d12	0.014	-0.024	0.000	-0.009
Rho	0.649	0.790		0.740
Obs.	798	798	798	798
Countries	97	97	97	97

* p<0.05, ** p<0.01, *** p<0.001

Table 9 Determinants of the Inclusive Industrialization Development index (IID): The role of manufacturing. Different estimators, 5-year averages, 1970-2014

	Random Effects	Fixed Effects	Between	Hausman-Taylor
Constant	0.448	0.339	0.749	0.500
CLIMATE	0.014	0.000	-0.006	0.023
NNRR	0.033	0.000	0.034	0.035
Ln(y)	0.120	0.115	-0.059	0.125
$Ln(y)^2$	-0.007	-0.007	0.005	-0.008
Ln(OPEN)	0.029**	0.030*	0.010	0.027***
Ln(INV)	-0.020	-0.016	-0.064	-0.015
Ln(EDU)	-0.003	-0.036	0.066	-0.031
Ln(OLD)	0.109**	0.081	0.144**	0.091**
Ln(MEMPsh)	0.029	0.030	0.033	0.029*
Europe (adv.)	-0.038	0.000	0.001	-0.053
Asia (adv.)	-0.127**	0.000	-0.068	-0.149*
Africa	-0.138	0.000	0.014	-0.222**
Latin America	-0.226***	0.000	-0.124	-0.280***
Asia (dev.)	-0.192**	0.000	-0.058	-0.264**
Europe (dev.)	-0.126**	0.000	-0.058	-0.160*
Oceania (dev.)	0.000	0.000	0.000	
d77	0.009	0.015	0.060	0.014
d82	0.002	0.013	0.265	0.012
d87	-0.027	-0.010	0.305	-0.012
d92	-0.037	-0.015	0.097	-0.018
d97	-0.048	-0.020	0.222	-0.024
d02	-0.056	-0.024	0.000	-0.028
d07	-0.071*	-0.035	0.000	-0.039
d12	0.000	0.000	0.000	0.000
Rho	0.614	0.790		0.639
Obs.	644	644	644	644
Countries	95	95	95	95

* p<0.05, ** p<0.01, *** p<0.001

Appendix 3 The role of medium- and low-tech industries

Table 10. Determinants of social inclusiveness: The role of medium-tech industries Hausman-Taylor estimator, 5-year averages, 1970-2014

	NPR	HDI	EI	IID
Constant	0.000	0.000	0.086	0.150
CLIMATE	0.050	0.029	-0.017	0.023
NNRR	0.053	0.051*	-0.004	0.045
Ln(y)	0.697***	0.000	0.094*	0.239**
$Ln(y)^2$	-0.038***	0.000	-0.006*	-0.014**
Ln(OPEN)	0.028*	-0.002	-0.019***	0.025*
Ln(INV)	0.023	0.016**	0.000	-0.026*
Ln(EDU)	0.044	0.000	0.064***	-0.074**
Ln(OLD)	0.137*	0.063***	-0.042**	0.108***
Ln(MEMPsh)	0.096***	0.029***	0.026**	0.036*
MTsh	-0.007	-0.066*	-0.047	-0.240*
Europe (adv.)	0.000	-0.038	0.028	-0.059
Asia (adv.)	0.000	0.003	0.008	-0.146
Africa	0.000	-0.255***	-0.048	-0.229*
Latin America	0.070	-0.131*	-0.106	-0.303***
Asia (dev.)	-0.182**	-0.227***	-0.017	-0.275**
Europe (dev.)	-0.024	-0.122	0.017	-0.164
Oceania (dev.)				
d77	0.000	0.000	0.001	0.023
d82	-1.842**	0.975***	0.002	0.028*
d87	-1.840**	0.996***	-0.002	0.004
d92	-1.856**	1.019***	-0.010	-0.007
d97	-1.870**	1.038***	-0.020	-0.007
d02	-1.869**	1.061***	-0.017	-0.013
d07	-1.828**	1.097***	-0.010	-0.015
d12	-1.802**	1.111***	-0.012	0.000
Rho	0.847	0.939	0.793	0.710
Obs.	343	474	673	587
Countries	68	85	96	95

* p<0.05, ** p<0.01, *** p<0.001

Table 11. Determinants of social inclusiveness: The role of low-tech industries Hausman-Taylor estimator, 5-year averages, 1970-2014

	NPR	HDI	EI	IID
Constant	-1.787**	0.000	0.088	0.109
CLIMATE	0.043	0.024	-0.023	0.016
NNRR	0.046	0.046	-0.007	0.040
Ln(y)	0.700***		0.104*	0.234**
$Ln(y)^2$	-0.038***		-0.007**	-0.014**
Ln(OPEN)	0.029*	-0.002	-0.018***	0.025*
Ln(INV)	0.023	0.015**	0.000	-0.026*
Ln(EDU)	0.042		0.064***	-0.072**
Ln(OLD)	0.141**	0.064***	-0.034*	0.118***
Ln(MEMPsh)	0.092***	0.028***	0.022**	0.035*
LTsh	-0.078	-0.037	-0.051	0.058
Europe (adv.)	0.000	-0.041	0.022	-0.062
Asia (adv.)	0.000	0.001	0.008	-0.148
Africa	0.000	-0.247***	-0.037	-0.222*
Latin America	0.074	-0.122*	-0.095	-0.298***
Asia (dev.)	-0.187***	-0.223***	-0.010	-0.268**
Europe (dev.)	-0.032	-0.120	0.017	-0.163
Oceania (dev.)				
d77	0.000	0.000	-0.001	0.021
d82	-0.002	0.983***	-0.001	0.025
d87	0.000	1.004***	-0.004	0.001
d92	-0.014	1.027***	-0.013	-0.009
d97	-0.029	1.046***	-0.023*	-0.012
d02	-0.027	1.069***	-0.019	-0.018
d07	0.014	1.104***	-0.015	-0.024
d12	0.037	1.116***	-0.019	0.000
Rho	0.845	0.935	0.803	0.699
Obs.	343	474	673	587
Countries	68	85	96	95

* p<0.05, ** p<0.01, *** p<0.001

UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

Vienna International Centre · P.O. Box 300 9 · 1400 Vienna · Austria
Tel.: (+43-1) 26026-0 · E-mail: info@unido.org
www.unido.org