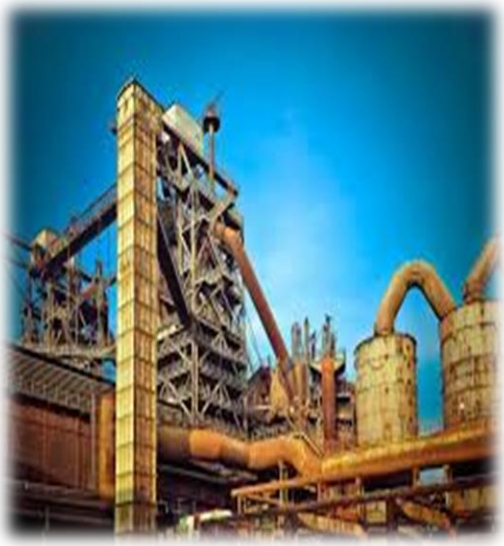

“Industrial Concentration, Economic Growth, and Inequality dynamics throughout the stages of industrialisation: a comparative and transnational analysis”

By Matteo Calabrese

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"Industrial Concentration, Economic Growth, and Inequality dynamics throughout the stages of industrialisation: a comparative and transnational analysis"

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1. INTRODUCTION

The impact of industrialisation on social inequality dynamics has been subject to debate in many contexts. In academia but also at the policy-making level. Whereas the relationship between economic growth and inequality has been investigated in numerous studies[1], very few have focused instead, on the role played by the level of industrial concentration into this equation. The growth of GDP per capita can have a positive or negative effect on the level of social inequality depending on the integrative leverage of a broad group of variables: the initial wealth and geographic endowments[2], the quality of institutions[3], trade and globalisation variables[4], the growth rate of the population[5], and so on. The level of industrial concentration can be considered as part of this group of variables. On the one hand, it gives a measure of the spatial transformation occurring throughout the stages of the

[1] Cf. Klaus Deininger, and Lyn Squire, "A New Data Set Measuring Income Inequality," *World Bank Economic Review* 10, no. 3 (September 1996): 565–591; Kristin J. Forbes, "A Reassessment of the Relationship between Inequality and Growth," *The American Economic Review* 90, no. 4 (September 2000): 869-887; Orazio Attanasio, Pinelopi K. Goldberg, and Nina Pavcnikc, "Trade reforms and wage inequality in Colombia," *Journal of Development Economics* 74 (August 2004): 331– 366; Abhijit V. Banerjee and Esther Duflo, "Inequality and Growth: What Can the Data Say?" *Journal of Economic Growth* 8 (June 2003): 267–99; Florence Jaumotte, Subir Lall, and Chris Papageorgiou, "Rising Income Inequality: Technology or trade and financial globalization?", *C. IMF Economic Review* 61, no. 2 (April 2013): 271-309; Augustin K. Fosu, "Growth, Inequality and Poverty in Sub-Saharan Africa: Recent Progress in a Global Context," *Oxford Development Studies* 43, no.1 (2015): 44-59.

[2] Cf. William Easterly, "Inequality does cause underdevelopment: Insights from a new instrument," *Journal of Development Economics* 84, (2007): 755–776.

[3] Cf. Daron Acemoglu, Simon Johnson, and James A. Robinson, "The Rise of Europe: Atlantic Trade, Institutional Change, and Economic Growth," *American Economic Review* 95, no. 3 (2005): 546-579.

[4] Cf. Orazio Attanasio, Pinelopi K. Goldberg, and Nina Pavcnikc, "Trade reforms and wage inequality in Colombia," *Journal of Development Economics* 74 (August 2004): 331– 366; Abhijit V. Banerjee and Esther Duflo, "Inequality and Growth: What Can the Data Say?" *Journal of Economic Growth* 8 (June 2003): 267–99; Florence Jaumotte, Subir Lall, and Chris Papageorgiou, "Rising Income Inequality: Technology or trade and financial globalization?", *C. IMF Economic Review* 61, no. 2 (April 2013): 271-309.

[5] Cf. Ayodele Odusola, Frederick Mugisha, Yemersrach Workie, and Wilmot Reeves, "Income Inequality and Population Growth in Africa," UNDP Africa Reports 267039, United Nations Development Programme, 2017; Derek D. Heady, and Andrew Hodge, "The effect of population growth on economic growth: A meta-regression analysis of the macroeconomic literature," *Population and Development Review 35*, no. 2 (June 2009):221-248; Tai-Hsin Huang, and Zixiong Xie, "Population and economic growth: A simultaneous equation perspective," *Applied Economics 45*, (2013): 3820-3826.

industrialisation process. At the same time, in turn, endogenously affects both the level of economic growth (by triggering forms of "circular causation" in the general demand[6]) and the level of social inequality (through periphery-to-core migrations of populations[7]).

1.1 Research Question

The purpose of the present study is analysing the patterns of industrial concentration, economic growth, and household income inequality through an integrative perspective. The main research question analysed throughout the thesis is:

To what extent is it possible to prospect a relationship between these three variables?

The countries subject of the research are chosen based on their significance in the light of the critiques to the Kuznets' hypothesis and secondly, on their availability in the main primary source used in the present research: the IPUMS International collection of historical census datasets. They can be ultimately divided in three major groups:

a) the US, Canada, the UK, and part of the Western countries analysed by Midelfart-Knarvik et al.[8] (Italy, France, Germany, and Spain). For this group, the time range analysed is from 1860 to 2011.

b) the group of Latin American countries, with Argentina and Brazil. This group is analysed in order to evaluate the critique of Deinenger and Squire[9] to Kuznets' theory and since the two countries available in the dataset were "new-comers" to industrialisation in the 1960s[10]. The time range here analysed, due to the IPUMS datasets availability, is 1960-2000.

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[6] Cf. Paul Krugman, "Increasing returns and economic geography," *Journal of Political Economy* 99, no. 3 (June 1991): 483 – 499.
[7] Cf. Simon Kuznets, "Economic Growth and Income Inequality," *American Economic Review* 45, no.1 (March 1955): 1–28.
[8] Karen Helene Midelfart-Knarvik, Henry G. Overman, Stephen J. Redding, and Anthony J. Venables, "The Location of European Industry," report for the European Commission, 2000.
[9] Klaus Deininger, and Lyn Squire, "A New Data Set Measuring Income Inequality," *World Bank Economic Review* 10, no. 3 (September 1996): 565–91, p.259.
[10] Cf. Alan Gilbert, and David Goodman, "Regional income disparities and economic development: a critique", in *Development Planning and Spatial Structure*, ed. Alan Gilbert (London, 1976), 113-141; Belen Barroeta, Javier Gómez, Prieto Jonatan, and Paton Manuel Palazuelos, "*Innovation and Regional Specialisation in Latin America Identifying conceptual relations with the EU Smart Specialisation*

c) The group of available new industrialising countries in East and South-East Asia: China, Thailand, Malaysia, and Indonesia. This group is analysed in order to evaluate the critique of the World Bank Report of 1993[11] to Kuznets' theory. The time range analysed is from 1970 to 2000.

1.2 Thesis structure and sub-research questions

The research is organised as follows:

Firstly, an introductive chapter with an analysis of the primary sources used, a discussion on the methodology, and a literature review about the relationship between industrial specialisation, economic growth, and inequality.

Chapter 2 is dedicated to a historical analysis of the trends of industrial concentration and income inequality. Two main sub-research questions will be assessed:

- Is it possible to find common paths of development among the countries object of the research, based on the analysis of the trends for industrial concentration and income inequality throughout the Twentieth Century?

- Does industrial concentration for Europe have an upturn during the 1970s, consistently with Milanovic's theory on a second Kuznets' wave starting in those years?

Chapter 3 contains theoretical insights that can be derived from my analysis of the industrial concentration and income inequality series for the Twentieth Century. Again, two sub-research questions are analysed:

- Are the 1970s the beginning of a new Kuznets' wave for the Western world (despite declining levels of industrial concentration)?

approach," technical report by the Joint Research Centre (JRC), the European Commission's science and knowledge service, 2017.

[11] Nancy M. Birdsall, Jose E. L. Campos, Chang-Shik Kim, W. Max Corden, Lawrence Mac Donald, Howard Pack, John Page, Richard Sabor, and Joseph E. Stiglitz, "*The East Asian miracle : economic growth and public policy : Main report (English)*," World Bank policy research report, 1993.

- How to explain on the one hand, the quick reduction of the levels of industrial concentration after the Second World War, and on the other, the either increasing or decreasing value of the Krugman Index concurrently with economic and financial crises?

Chapter 4 is dedicated to the implications that the analysis of the industrial concentration and income inequality series for the Twentieth Century has for future scenarios in the Twenty-First Century. I discuss in the first place, the possibility of an inversion of the industrial concentration trend, starting from the 2010s. Secondly, I analyse the possible effects of the economic shock related to the Covid-19 pandemic on the values for industrial concentration in the 2020 decade. Finally, I focus on possible research directions for the analysis of the industrialisation development in sub Saharan Africa (SSA) countries, between the 1990s and the 2010s.

The conclusions summarise my results and prospect related policy implications.

1.3. Primary Sources

The primary sources used in the present research are in the first place, census data. The IPUMS Center has made available a group of sample datasets for 98 countries[12], derived from census surveys starting from the 1960s (sometimes with historical sections from previous years) and collected every ten years until the 2010s. All the original census data have been stratified and harmonised by the Centre. In this way, on the one hand the original composition of the population has been preserved albeit subject to the sampling process – namely, the sample is not taken in a random way: the basic data topology is maintained and mirrored throughout the sample[13]. On the other, the variables related to the characteristics of the individuals surveyed (from the type of assets owned to the industry in which they are employed) are conveyed to standard categories, making therefore easier the work for

[12] The aggregated census datasets from the IPUMS International online archive can be found at https://international.ipums.org/international/*Minnesota Population Center. Integrated Public Use Microdata Series, International: Version 7.2 [dataset]. Minneapolis, MN: IPUMS, 2019. https://doi.org/10.18128/D020.V7.2*

[13] Furthermore, the samples are still quite big: from 900 000 individuals to 10 000 000.

researchers interested in comparative analyses. In the present research, I used in total 49 census datasets from different decades, for 13 countries.

The highlighted components are:

1) the occupational distribution of the population, across those sectors that roughly correspond to the first level of codification in the occupational classification elaborated by the CAMPOP project at Cambridge University[14]. In Tab. 1 (below), the main industries of the occupational structure are listed. It is considered the population in the age range 15-64, following the OECD International Labour Organization (ILO) definitions for the population of working age[15]. Furthermore, following the approach used in other studies[16], the NIU group is excluded from the calculations for the Krugman Index, since the focus of the study is on the sole manufactures and services patterns of specialization throughout time. The group "Not in Universe" collects those individuals not employed in the primary, secondary or tertiary sectors. Therefore, unemployed or not in the labour force. Whereas the information contained in this group represents an important piece in order to understand the evolution of the labour market dynamics in the country or region analysed – notably, the role of women, that account for almost 3/4 of the NIU group on average – it is here ignored, due to the focus of the study on the processes of industrial clustering. Essentially, what is here assessed are not the absolute numbers – e.g. how many people are employed in a certain industry in a country – but how much the production activities cluster at the regional and national level. In this respect, it is worth mentioning that also the information relatively to the dynamics of the single types of manufactures – for example, shoemakers or brewers, or textiles – is lost when all of them are included in the sub-category "Manufacturing". In the same way as for the absolute numbers above, what is here investigated is not the degree of concentration of the specific production activities but the general trends of spatial conglomeration of the overall set of production activities (including services).

[14] For the last update of the CAMPOP classification criteria. Cf. Edward A. Wrigley, "The PST system of classifying occupations," Cambridge Group for the History of Population and Social Structure, University of Cambridge, unpublished paper, 2010.

[15] Cf. Tito Boeri, *The Economics of Imperfect Labor Markets: Second Edition* (Princeton University Press, 2013), 5, Kindle.

[16] Cf. Robin Philips, Matteo Calabrese, Robert Keenan, and Bas van Leeuwen, "The regional occupational structure in Interwar England and Wales," unpublished paper, 2019.

Tab. 1. Occupational structure format for all the countries analysed. Source: IPUMS, 2020

NIU (not in universe)	Private household services
Agriculture, fishing, and forestry	Financial services and insurance
Mining	Public administration and defense
Manufacturing	Real estate and business services
Electricity, gas and water	Education
Construction	Health and social work
Wholesale and retail trade	Other services
Hotels and restaurants	Unknown
Transportation, storage and communicati	

2) The geographical unit, that roughly corresponds to the NUTS1 (Nomenclature of Territorial Units for Statistics) level. The NUTS system is the standard for statistical surveys as defined by Eurostat and adopted by the European Union. This system gives a hierarchical subdivision of the economic territory of the EU. NUTS1 is the level of "major socio-economic regions" (see https://ec.europa.eu/eurostat/web/nuts/background).

The major limitations in the use of IPUMS as a primary source lie in the first place, in the fact that not all the countries have the same availability of datasets throughout the years. Notably, a lack of data for the years after the 2000s is common to many of the countries analysed.

Secondly, an inner characteristic of the census data collections should also be considered as a factor to be carefully assessed throughout the analysis. Census surveys are usually

implemented every ten years, and typically during the first or the second year of the decade. For this reason, the societal picture emerging from each census survey should be more correctly considered as being directly affected by the events and the governmental policies of the prior decade. For example, the result I obtain for the Argentinian degree of industrial concentration in 1990, must be linked to the governmental policies of the 1980s and not to those of the following decade. The outcome of the policies and economic events that occurred in the 1990s is instead reflected in the value which I found for the year 2000.

GDP per capita data are extracted from the harmonised historical series of GDP data of the Maddison Project Database at https://www.rug.nl/ggdc/historicaldevelopment/maddison/releases/maddison-project-database-2018. GINI coefficients for the historical series of the US and the UK are derived from Milanovic's reconstruction of these series[17]. GDP growth data and GINI coefficients for the years after the 1960s are derived from the World Bank datasets (https://data.worldbank.org/) and the Clio-Infra database (https://clio-infra.eu/)

Whereas the major limitations of the Maddison Database are well known – namely, the fact that all the figures of the pre-industrial era should be considered as estimates, due to the lack of reliable statistical data for those years[18]– a more thorough explanation should be devoted to the choice of the GINI coefficient as an indicator of the level of inequality for the societies object of the research.

The GINI coefficient is a proxy number for the actual level of equality in the distribution of income and wealth in each country here assessed. Many other measures of income inequality and poverty have been proposed throughout the years: from the relative mean variation to the 80/20, 90/10, 95/5 ratios[19] for the measurement of income inequality, to the head-count

[17] Branko Milanovic, "The inequality possibility frontier: the extensions and new appliacations," *Comparative Institutional Analysis Working Paper Series* 13, (2013):1-28.
[18] Cf. Thomas Piketty, *Capital in the twenty-first century* (Belknap Press of Harvard University Press, 2014); Branko Milanovic, *Global inequality: a new approach for the age of globalization* (Cambridge, Massachusetts: Harvard University Press, 2016).
[19] These ratios evaluate the differences in income distribution between the percentiles of the population. For example, the 90/50 gives the distance between the top deciles and the middle ones;

ratio and the aggregate poverty gap for a quantification of the level of poverty[20]. Piketty[21] has extensively argued the insufficiency of the GINI coefficient as a global indicator of the wealth distribution within and between nations. In effect, the GINI coefficient, calibrated solely on income inequalities, gives only a part of the picture. The gains on yields and rents of the resurging "society of rentiers" do not enter in the GINI mathematical relation.

Despite the soundness of these observations, in the present study, it will be nevertheless still used the GINI coefficient for the following reasons: a) like the Krugman-Index (discussed in the next paragraph) and on the contrary of the relative mean variation, it respects the "Pigou–Dalton Principle of Transfers"[22]; b) on the contrary of the percentiles and deciles ratios and of the poverty measurement, it gives (despite some loss of information, especially in the confrontation between the top and middle percentiles and deciles) a measure that can be more easily used as a harmonised index in the comparison between low, middle and high income countries; c) the World Bank and the other publications of the countries here analysed adopt the GINI coefficient. Summing up: although it does not fully describe the whole body of relations and issues relative to the wealth and income distribution, it is an effective and immediate proxy for it.

1.4. Methodology

The work of Krugman on trade theory and economic geography[23] has introduced a model able to integrate comparative advantage and geographical endowment factors to

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the 99/90, gives the distance between the highest percentiles and the high ones (see for example, https://www.equalitytrust.org.uk/how-economic-inequality-defined)

[20] For a more extensive discussion on these indexes: Jean Hindriks, and Gareth D. Myles, *Intermediate Public Economics* (MIT Press, 2013), Kindle.

[21] Thomas Piketty, *Capital in the twenty-first century* (Belknap Press of Harvard University Press, 2014)

[22] Namely that "the inequality index decreases if there is a transfer of income from a richer household to a poorer household that preserves the ranking of the two households in the income distribution and leaves the total income unchanged" (Jean Hindriks, and Gareth D. Myles, *Intermediate Public Economics* (MIT Press, 2013), 470, Kindle.

[23] Cf. Paul Krugman, "Increasing returns and economic geography," *Journal of Political Economy* 99, no. 3 (June 1991): 483 – 499; Paul Krugman, "The Myth of Asia's Miracle," *Foreign Affairs* 73, (November/December 1994): 62-78; Paul Krugman and Anthony J. Venables, "The Seamless World: A

"path-dependence"[24] factors (such as the evolution of transportation costs and forms of circular causation of demand).

In Krugman's model, the above-mentioned elements are eventually combined in a coherent formulation including a) variations in the transportation costs, b) scale economies and spill-overs benefits (e.g.: Marshallian externalities, pecuniary and non-pecuniary externalities; c) the variation of the demand linked to processes of "circular causation" - namely, when "other things equal, it will be more desirable to live and produce near a concentration of manufacturing production because it will then be less expensive to buy the goods this central place provides [..] Manufactures production will tend to concentrate where there is a large market, but the market will be large where manufactures production is concentrated"[25].

In the present study, I will derive the index of specialisation, named after him, to assess firstly the level of regional specialisation and then, from the average of the regional values, the country level of specialisation, being the latter the main variable of interest. Many of the studies focusing on industrial concentration have used Krugman-type indexes[26]. The Krugman

Spatial Model of International Specialization," *Centre for Economic Policy Research,* Discussion Paper, no. 1230, 1995.

[24] Path dependence is in the definition of David a "dynamic process whose evolution is governed by its own history " (Paul. A. David, "Path dependence: a foundational concept for historical social science," *Cliometrica* 1, no. 2 (May 2007): 91 – 114, p. 91).
For other applications of a path dependency approach to economic geography studies cf. Nicholas Crafts, and Nikolaus Wolf, "The Location of the UK Cotton Textiles Industry in 1838: A Quantitative Analysis," *The Journal of Economic History* 74, no.4 (December 2014): 1103-1139; Stefan Nikolic, "Determinants of industrial location: Kingdom of Yugoslavia in the interwar period," *European Review of Economic History* 22, no. 1, (February 2018): 101–13.

[25]" Paul Krugman, "Increasing returns and economic geography," *Journal of Political Economy* 99, no. 3 (June 1991): 483 – 499, p. 486.

[26] Cf. Sukkoo Kim, "Economic Integration and Convergence: U.S. Regions, 1840–1990," *Journal of Economic History* 58, no. 3 (April 1998): 659–683; Karen Helene Midelfart-Knarvik, Henry G. Overman, Stephen J. Redding, and Anthony J. Venables, "The Location of European Industry," report for the European Commission, 2000; Nicholas Crafts, and Abay Mulatu, "What explains the location of industry in Britain, 1871–1931?", *Journal of Economic Geography* 5, no. 4 (August 2005): 499-518; Thor Berger, Kerstin Enflo, and Martin Henning, "Geographical location and urbanisation of the Swedish manufacturing industry, 1900–1960: evidence from a new database," *Scandinavian Economic History Review* 60, no.3 (November 2012): 290-308; Anna Missiaia, "The industrial geography of Italy: provinces, regions and border effects (1871–1911)" (PhD diss., London School of Economics, 2015), Chapter 2; Stefan Nikolic, "Determinants of industrial location: Kingdom of Yugoslavia in the interwar period," *European Review of Economic History* 22, no. 1, (February 2018): 101–13; Robin Philips, Matteo Calabrese, Robert Keenan, and Bas van Leeuwen, "The regional occupational structure in Interwar England and Wales," unpublished paper, 2019.

Index respects indeed a series of criteria that make it a reliable indicator: the principle of "enforced anonymity" ensures that the resulting degree of specialization is the same for different permutations of the same employment share. The 'Pigou-Dalton Principle' ensures equity of allocation throughout the rankings[27]. Moreover, this index offers a further advantage: since it is the most used index for this type of analyses, a work of comparison between the previous studies and the present one is therefore facilitated.

The index is calculated as follows:

$$KSI_r = \sum_i ABS\,(s_{r,i} - s_i) \qquad (1)$$

where $s_{r,i}$ is the share of sector $_i$ of total employment in region $_r$ and s_i is the share of sector $_i$ in the overall country (in the same way as a standard deviation of the values of the sectors per region from the average values of the country). The numerical value of the specialization index ranges from 0, in the case that the regions have an identical sector structure compared to the national structure, to 2, in which the sector structure is completely different across regions.

1.5 Theoretical framework

Already in Kuznets' theory, the spatial transformation of the industrial tissue is one of the primary factors on the basis of the strict relationship that he individuates between economic growth (GDP per Capita growth) and the level of income inequality. Migrations from the "agricultural periphery" towards the "industrialized core"– as in the definition of Krugman[28] – have a profound effect on the overall income distribution. The household incomes of the agricultural population are typically smaller than the urban ones and have a

[27] Cf. Nicole Palan, "Measurement of Specialization – The Choice of Indices," FIW Working Paper N° 62, 2010.
[28] Paul Krugman, "Increasing returns and economic geography," *Journal of Political Economy* 99, no. 3 (June 1991): 483 – 499, p.485.

more equal distribution. For Kuznets, therefore, "first, [..] the increasing weight of urban population means an increasing share for the more unequal of the two component distributions. Second, the relative difference in per capita income between the rural and urban populations does not necessarily drift downward in the process of economic growth"[29].

Subsequent studies by Williamson [30], Lindert and Williamson [31], Harris and Todaro[32] , Rauch[33], and Kim[34] have gone further in this path, by hypothesising a relation between the level of the industrial concentration and the so-called "Kuznets curve" alongside the overall cycle of the economic development. In Kuznets' curve, the level of household income inequality first raises and then, after reaching a peak, drops while the development of the country (GDP per capita) goes forward – in the characteristic inverted U-shaped form. In the same way, the level of industrial concentration follows a similar pattern. In the initial phases of the industrialization, the tendency towards geographical conglomeration of the manufactures increases. Afterwards, throughout the successive stages of the development, the distribution of the industries becomes more diversified. Thus, the values for industrial concentration become smaller and smaller.

A complete negation of the findings and research approach of Williamson has been proposed by Krebs. Starting from the considerations of Therkildsen[35] on the biases of the empirical method of Williamson – based on the calculation of the spatial inequality through a coefficient of variation – he finds that "the paradigm of converging regional disparities does not meet with strong support from recent data. The patterns of regional development in less-

[29] Simon Kuznets, "Economic Growth and Income Inequality," *American Economic Review* 45, no.1 (March 1955): 1–28, p. 7-8.
[30] Jeffrey Williamson, "Regional Inequality and the Process of National Development: A Description of the Patterns," *Economic Development and Cultural Change* 13, (1964): 3–84.

[31] Peter Lindert, and Jeffrey Williamson, "Growth, Equality and History," *Explorations in Economic History* 22, (1985): 341–77.
[32] John R. Harris, and Michael P. Todaro., "Migration, Unemployment and Development: Two-Sector Analysis," *American Economic Review* 60, no. 1 (1970): 126–42.
[33] James E. Rauch, "Economic Development, Urban Underemployment, and Income Inequality," *Canadian Journal of Economics* 26, no. 4 (November 1993): 901–18.
[34] Cf. Sukkoo Kim, "Economic Integration and Convergence: U.S. Regions, 1840–1990," *Journal of Economic History* 58, no. 3 (April 1998): 659–83; Sukkoo Kim, "Spatial Inequality and Economic Development: Theories, Facts, and Policies," working Paper n. 16, 2008.
[35] Ole Therkildsen, "The relationship between economic growth and regional inequality: a critical reappraisal," paper presented at the Fourth Advanced Studies Institute in Regional Science Siegen, 1978.

developed countries indicate just the opposite of a stabilizing spatial transformation. In industrialized countries hardly any significant convergence of the regional income level can be observed, though the degree of spatial concentration and the gap between high and low-income regions is considerably less" [36].

Many studies, though, have afterwards empirically demonstrated the existence of that type of bell-shaped curve for industrial concentration, throughout the stages of the industrialisation process. Kim, for example, obtains a Williamson-type pattern of industrial concentration alongside the curve of economic development of the US, between the second half of the Nineteenth Century and the Twentieth[37]. The US, during this time frame, became indeed more and more de-specialised, concurrently with the growth of the services sector[38]. Tirado et al.[39] and Betran[40] find for Spain, in a consistent comparison with the US values found by Kim, increasing values of industrial concentration in the second half of the Nineteenth Century, and then a bell-shaped pattern with a peak in the Interwar years and a descending curve afterwards in the Twentieth. For Italy, Missaia[41] and Daniele et al.[42] find the same pattern with very high values of regional concentration in the early industrialization phases before the 1900 (even though Daniele et al. obtain smaller values compared to Missaia), and then the usual pattern decreasing after the wars until the 2000s. For England, the works of

[36] Gunter Krebs, "Regional Inequalities during the Process of National Economic Development: A Critical Approach," *Geoforum* 13, no. 2 (December 1982): 71-81.
[37] Cf. Sukkoo Kim, "Economic Integration and Convergence: U.S. Regions, 1840–1990," *Journal of Economic History* 58, no. 3 (April 1998): 659–83; Sukkoo Kim, "Spatial Inequality and Economic Development: Theories, Facts, and Policies," working Paper n. 16, 2008.
[38] *Ibid.,* p.15
[39] Daniel A. Tirado, Elisenda Paluzie, and Jordi Pons, "Economic Integration and Industrial Location: The Case of Spain before World War I," *Journal of Economic Geography* 2, no.3 (July 2002):343–63.
[40] Concha Betran, "Regional specialisation and industry location in the long run: Spain in the US mirror (1856–2002)," *Cliometrica* 5, no. 3 (October 2011): 259-290.
[41] Anna Missiaia, "The industrial geography of Italy: provinces, regions and border effects (1871–1911)" (PhD diss., London School of Economics, 2015).
[42] Vittorio Daniele, Paolo Malanima, Nicola Ostuni, "Unequal Development. Geography and Market Potential in Italian Industrialisation 1871-2001," *Regional Science Association Journal* 97, no.3 (August 2018): 639-662.

Lee[43] firstly, and then of Crafts and Mulatu[44] as well as Philips et al.[45] show again the bell pattern with a peak in the Interwar years. Philips[46] for Belgium and Netherlands, and Berger, Enflo, and Henning[47] for Sweden confirm also for these countries the same bell-shaped pattern with a peak in the Interwar years. Finally, Midelfart-Knarvik et al.[48] have then investigated the pattern for industrial concentration for the whole Europe, from an integrated perspective. Their results show for Europe, when compared to the U.S, lower levels of regional specialisation in absolute values. Furthermore, and more importantly, on the contrary of the US (from Kim's results), their pattern is increasing from the late 1980s.

Extending the glaze towards the other contexts of interest for the present research, Gilbert and Goodman[49] find for Brazil increasing levels of spatial concentration for industries and population, starting from the 1940s (also due to the external and internal migration flows). At the same time, despite a growth of the income per capita, the level of inequalities was growing as well[50]. Azzoni et al.[51] find that regional spatial inequality started to decline from the 1980s (until 1997, last year they check for). In the same years, in Argentina, Barroeta et al.[52] find that a process of regional de-specialisation was ongoing in the long run despite the

[43] Cf. John C. H. Lee, *British Regional Employment Statistics, 1841-1971 (*Cambridge: Cambridge University Press, 1979).

[44] Cf. Nicholas Crafts, and Abay Mulatu, "What explains the location of industry in Britain, 1871–1931?", *Journal of Economic Geography* 5, no. 4 (August 2005): 499-518

[45] Cf. Robin Philips, Matteo Calabrese, Robert Keenan, and Bas van Leeuwen, "The regional occupational structure in Interwar England and Wales,*"* unpublished paper, 2019.

[46] Cf. Robin Philips, "Continuity or Change? The Evolution in the Location of Industry in the Netherlands and Belgium (1820 – 2010)", (PhD diss., Amsterdam University, 2020).

[47] Cf. Thor Berger, Kerstin Enflo, and Martin Henning, "Geographical location and urbanisation of the Swedish manufacturing industry, 1900–1960: evidence from a new database," *Scandinavian Economic History Review* 60, no.3 (November 2012): 290-308.

[48] Cf. Karen Helene Midelfart-Knarvik, Henry G. Overman, Stephen J. Redding, and Anthony J. Venables, "The Location of European Industry," report for the European Commission, 2000.

[49] Cf. Alan Gilbert, and David Goodman, "Regional income disparities and economic development: a critique", in *Development Planning and Spatial Structure*, ed. Alan Gilbert (London, 1976)*,* 113-141.

[50] *Ibid.,* p.129

[51] Cf. Carlos Azzoni, Naercio Menezes-Filho, and Taitane Menezes, "Opening the Convergence Black Box: Measurement Problems and Demographic Aspects," in *Spatial Inequality and Development*, eds. R. Kanbur and A.J. Venables (Oxford: Oxford University Press, 2005).

[52] Belen Barroeta, Javier Gómez, Prieto Jonatan, and Paton Manuel Palazuelos, "*Innovation and Regional Specialisation in Latin America Identifying conceptual relations with the EU Smart Specialisation approach,*" technical report by the Joint Research Centre (JRC), the European Commission's science and knowledge service, 2017, p. 26.

contrasting action of governmental policies in the 1980s and in the 1990s. Tambunan[53] for Indonesia and Ying[54] for China find an empirical correlation between high concentration of regional economic activity and development gaps between East-Asian regions after the 1960s. Focusing on China, Hu[55] individuates in the foreign trade another factor interfering in the relationship between industrial concentration and development dynamics. Nakajima et al.[56] empirically demonstrate for Indonesia (in the time span 1980-2000) that the initial distribution of input factors has the major role in the future industrial concentration outcomes. For Malaysia, Roslan[57] finds decreasing levels of inter-regional spatial inequality between 1970-1990 as well as reducing levels of household income inequalities. For Thailand, Kittiprapas[58], and Pansuwan[59] find the same trend for industrial clustering: increasing between 1960-1980; declining between the 1990s and 2000s.

The above mentioned studies for the US, the UK, Spain, and Italy, focusing on the long run, have found this common pattern: a curve that grows throughout the first decades of the Twentieth Century, reaches a peak in the interwar years, and then descends in the second part of the century.

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[53] Tulus T.H. Tambunan, *Industrialization in Developing Countries: The Case of Indonesia (Industrialisasi di Negara Sedang Berkembang: Kasus Indonesia*) (Jakarta: Indonesian-Ghalia, 2001).

[54] Ge Ying, "Regional Inequality, Industry Agglomeration and Foreign Trade: The Case of China," research Paper No. 105, 2006.

[55] Dapeng Hu, "Trade, Rural-Urban Migration, and Regional Income Disparity in Developing Countries: A Spatial General Equilibrium Model Inspired by the Case of China," *Regional Science and Urban Economics* 32, no. 3 (May 2002): 311-38.

[56] Kentaro Nakajima, Yukiko Saito, and Iichiro Uesugi, "Measuring Economic Localization: Evidence from Japanese Firm-Level Data: Design of Inter Firm Network to Achieve Sustainable Economic Growth," Working Paper Series No. 10, 2012.

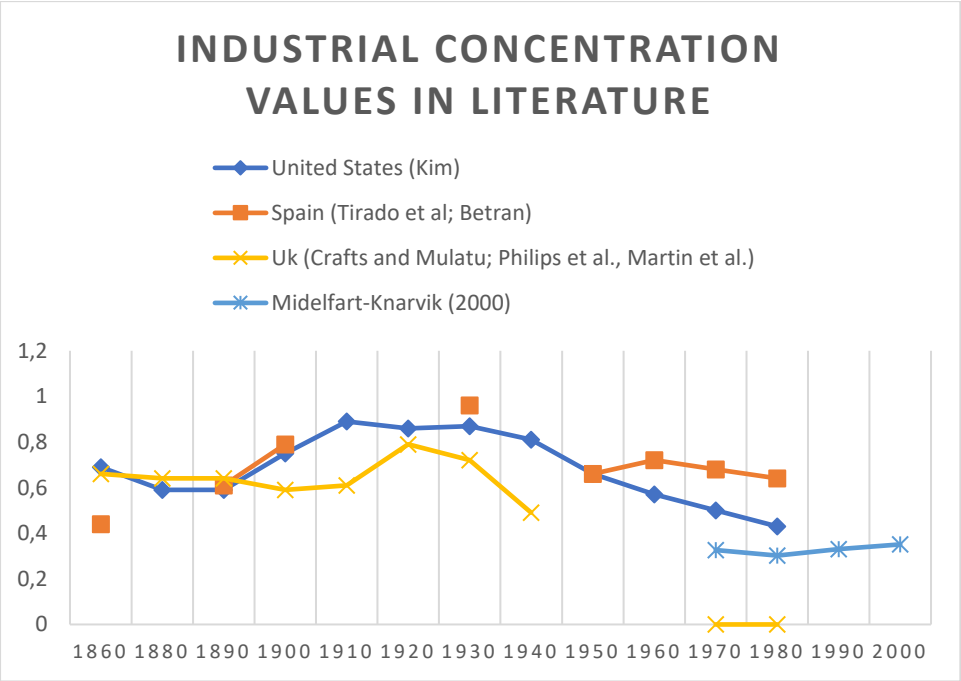
[57] Cf. Harhap A.H.Roslan, "Income Distribution and the Changing Tolerance towards Inequality in Malaysia – A Case of Hirschman's Tunnel Effect?", paper presented at the University of Wales Economics Colloquium on the 8-10 June 2000; Harhap A.H. Roslan, "Income Inequality, Poverty and Development Policy in Malaysia," paper presented at the International Seminar on "Poverty and Sustainable Development", 22 & 23 November 2001.

[58] Sauwalak Kittiprapas, "Regional concentration and the location behavior of manufacturing firms in the electronics and automobile industries in Thailand," *Dissertations available from ProQuest*,1995.

[59] Cf. Apisek Pansuwan, "Regional Specialization and Industrial Concentration in Thailand, 1996-2005. Indonesian," *Journal of Geography* 41, no.1 (June 2009): 1-17; Apisek Pansuwan, "Industrial Decentralization Policies and Industrialization in Thailand," *Silpakorn University International Journal* 9, n.10 (August 2010): 117-147.

The bells described in these curves, though, tend to have a series of oscillations that make the trend less smooth.

Graph 1. Historical Krugman Index series for Industrial Concentration for US, UK, Spain, Italy, and Europe.



Source: Kim (1995); Betran (2011); Daniele et al. (2013); Crafts and Mulatu (2005); Midelfart-Knarvik et al. (2000).

In the first place, as it is visible in the graph above, the figures for the industrial concentration typically have an increase between the end of 1800. Then, after an initial decrease during the first two decades of 1900 (see the US and the UK), a new increase in the Interwar years, and finally a decreasing after the wars (see in particular, the values found by Crafts and Mulatu

for Britain[60], Kim for the US[61], and Betran for Spain[62]). This perturbation can partially invalidate the idea of a perfect overlapping of the industrial concentration trend with the Kuznets curve, as it was originally conceived. However, this divergence in the trends should be linked with one of the most criticised aspects of Kuznets' theory (see for example, among the others, Piketty[63], and Milanovic[64]). Namely, that Kuznets "essentially ignores the roles of wars"[65]. The endogenous shock caused by wars – I follow here the theory of Milanovic about the endogenous character of this type of shock, in partial contrast with Piketty[66]– affects all the variables of interest in this research. As suggested by Milanovic, wars must be included in a Kuznets-type framework, since "wars can lead to declines in inequality but also, unfortunately, and more importantly, to declines in mean incomes"[67].

Secondly, as it is visible in the comparison in Graph 1 between the trend found for the US by Kim and the trend found for Europe by Midelfart-Knarvik et al.[68], industrial concentration, that is typically descendent in the second part of 1900, has instead for Europe an upturn in the 1970s. Again, the deviation from the original Kuznets curve can be reconsidered in the light of the critiques of Kuznets' hypothesis. In many quarters[69] have been indeed raised doubts about the real effectivity of his curve as a predictor of the level of income inequalities

[60] Nicholas Crafts, and Abay Mulatu, "What explains the location of industry in Britain, 1871–1931?", *Journal of Economic Geography* 5, no. 4 (August 2005): 499-518

[61] Cf. Sukkoo Kim, "Economic Integration and Convergence: U.S. Regions, 1840–1990," *Journal of Economic History* 58, no. 3 (April 1998): 659–83; Sukkoo Kim, "Spatial Inequality and Economic Development: Theories, Facts, and Policies," working paper n. 16, 2008.

[62] Concha Betran, "Regional specialisation and industry location in the long run: Spain in the US mirror (1856–2002)," *Cliometrica* 5, no. 3 (October 2011): 259-290.

[63] Thomas Piketty, *Capital in the twenty-first century* (Belknap Press of Harvard University Press, 2014).

[64] Branko Milanovic, *Global inequality: a new approach for the age of globalization* (Cambridge, Massachusetts: Harvard University Press, 2016).

[65] *Ibid.,* p.98.

[66] Cf. Thomas Piketty, *Capital et idéologie* (Le Seuil, Kindle Edition). Here Piketty has then analysed the endogenous nature of revolutions and class upheavals.

[67] Branko Milanovic, *Global inequality: a new approach for the age of globalization* (Cambridge, Massachusetts: Harvard University Press, 2016), p. 5

[68] Karen Helene Midelfart-Knarvik, Henry G. Overman, Stephen J. Redding, and Anthony J. Venables, "The Location of European Industry," report for the European Commission, 2000.

[69] Cf. Thomas Piketty, *Capital in the twenty-first century* (Belknap Press of Harvard University Press, 2014); Kristin J. Forbes, "A Reassessment of the Relationship between Inequality and Growth", *The American Economic Review* 90, no. 4 (September 2000): 869-887; William Easterly, "Inequality does cause underdevelopment: Insights from a new instrument," *Journal of Development Economics* 84, (2007): 755–776; Michael Kremer, "Population Growth and Technological Change: One Million B.C. to 1990," *The Quarterly Journal of Economics* 108, no. 3 (August 1993): 681-716.

in correlation with the level of economic development. Among the others, Deininger and Squire[70] find no proof for the Kuznets's relation between inequality and economic growth, after empirically testing a wide panel sample of countries. A famous World Bank Report from 1993[71], furthermore, brought to the general attention the fact that a group of East-Asian countries – Japan, South Korea, Taiwan, Hong Kong, Singapore, Thailand, Malaysia, and Indonesia – between the 1960s and the 1990s, followed a completely different pattern (than the one prospected by Kuznets) in their transformation towards fully industrialised countries. Whereas these East-Asian economies were rapidly increasing, the inequality numbers were kept somehow low, thanks to peculiar macroeconomics policies issued in combination with land reforms and investments in human capital endowment[72].

The upturn of the inequality level during the 1970s in the Western world has been extensively analysed by Piketty[73] and Milanovic[74]. The societies that had become industrialised throughout the first half of the Twentieth Century (or before) should have been, at that point, on the right (descending) branch of the Kuznets curve. Inequality was instead on the rise. Piketty explains the failure of Kuznets' formulation, by defining it as the product of a sort of history accident. For him, inequalities went down during the Twentieth Century mainly due to the exogenous shocks of the two World Wars. The U-turn from the 1970s should be therefore seen as the beginning of a return to "normality". Namely, to a society where the wealth divide is made stable by high capital returns. Milanovic, on the other hand, presents another explanation. Whereas "Piketty's ideas explain the trajectory of inequality in the United States and the United Kingdom over almost one hundred years from the early twentieth to the early twenty-first century, […] if we extend our gaze further back, into the eighteenth and nineteenth centuries, we see an increase in inequality that Piketty's theory does not explain"[75]. For this reason, Milanovic elaborates the concept of "Kuznets wave", able

[70] Klaus Deininger, and Lyn Squire, "A New Data Set Measuring Income Inequality," *World Bank Economic Review* 10, no. 3 (September 1996): 565–591.

[71] Nancy M. Birdsall, Jose E. L. Campos, Chang-Shik Kim, W. Max Corden, Lawrence Mac Donald, Howard Pack, John Page, Richard Sabor, and Joseph E. Stiglitz, "*The East Asian miracle : economic growth and public policy : Main report (English)*", World Bank policy research report, 1993.

[72] *Ibid.*

[73] Thomas Piketty, *Capital in the twenty-first century* (Belknap Press of Harvard University Press, 2014)

[74] Branko Milanovic, *Global inequality: a new approach for the age of globalization* (Cambridge, Massachusetts: Harvard University Press, 2016), p. 5.

[75] *Ibid.*, p.48

to give a more encompassing explanation to the oscillations of the inequality level around a fixed average income level in the pre-industrial world, to its drop after the two world wars, and finally to the rising inequality after the 1970s:

"In a nutshell, for the period before the Industrial Revolution, I argue that inequality moved in Kuznets waves undulating around a basically fixed average income level. […] Second, after the Industrial Revolution, inequality and mean income entered into a relationship that was absent before, when the mean income was fixed. I argue that a structural change (movement into a much more diversified manufacturing sector) and urbanization, along the lines proposed by Kuznets, drove inequality up starting from the time of the Industrial Revolution to a peak in the rich countries which occurred at the end of the nineteenth century or the beginning of the twentieth. […] The forces that drove inequality down after World War I had come to an end by the 1980s, the period around which we date the beginning of the second Kuznets curve for the rich countries. The 1980s ushered in a new (second) technological revolution, characterized by remarkable changes in information technology, globalization, and the rising importance of heterogeneous jobs in the service sector. This revolution, like the Industrial Revolution of the early nineteenth century, widened income disparities"[76]

The oscillations of the inequality level – and therefore the consequent structure of the Kuznets waves – are triggered by two types of forces: "benign", such as "technological change that favours low-skilled workers" or "widespread education"; or "malign", such as wars, revolutions, epidemics[77]. Both types of forces can potentially reduce inequalities and must be necessarily considered together when discussing the relationship between economic growth and social inequality throughout history.

[76] *Ibid.*, p.53-55
[77] *Ibid*., p.56

PART I

HISTORICAL INSIGHTS FROM THE ANALYSIS OF IPUMS DATASETS

In the hardest working part of Coketown; in the innermost fortifications of that ugly citadel, where Nature was as strongly bricked out as killing airs and gases were bricked in; at the heart of the labyrinth of narrow courts upon courts, and close streets upon streets, which had come into existence piecemeal, every piece in a violent hurry for some one man's purpose, and the whole an unnatural family, shouldering, and trampling, and pressing one another to death; in the last close nook of this great exhausted receiver, where the chimneys, for want of air to make a draught, were built in an immense variety of stunted and crooked shapes, as though every house put out a sign of the kind of people who might be expected to be born in it.

Charles Dickens, *Hard Times, Chapter X*

Electricity was used sparingly to save money, and most dinners were eaten in near-darkness. There was no plumbing and no heating. In the wet chill of a Hubei winter, the whole family wore their coats and gloves indoors, and the cement walls and floors soaked up the cold like a sponge. If you sat too long, your toes went numb, and your fingers too; the best remedy was to drink a cup of hot water, holding it with your hands while the steam warmed your face. The children often watched television standing up, jumping up and down to restore feeling in their toes.

Leslie T. Chang, *Factory Girls. From Village to a City in a Changing China*

2. Historical patterns of GDP growth, household income inequality, and industrial concentration: a bird-eye view

As a premise to the following analysis, it is important to stress that the Krugman Index values are not inherently bad or good. This number does not immediately represent the state of development of a country. Neither it is a measure of the level of industrialisation. More correctly, it is a geographical measure of the level of dispersion of all the industries that are operational throughout the regions of a country at a given time. For example, Spain in 1860 and Argentina in 1970 have the same value of industrial concentration at the country level – namely: 0.44, see Tab. 2 and Tab.5 in the Appendix. This equivalence, though, is just about the level of spatial disaggregation of all the industries (from the primary sector to the services) in the national territory.

In this sense, the pre-industrialised world and the current service-based economies tend to be, paradoxically, rather similar. Lower levels of industrial concentration – and, therefore, of industrial specialisation[78] – can be found for example for rural societies in the early years of their industrialisation take-off, as well as for high-income countries during the first decades of the Twentieth Century. The similarity, though, is just in the absolute values of the index.

The low levels of industrial concentration that I find for example for the Us, Canada, the UK, Spain, Italy, France, and Germany between the second half of 1900 and 2010s, reveal indeed

[78] Industrial concentration and industrial specialisation at the region and then country level can in effect be considered as specular concepts: "regional specialisation expresses the territorial perspective and depicts the distribution of the shares of the economic activities in a certain region, usually compared to the rest of the country, while geographic concentration of a specific economic activity reflects the distribution of its regional shares" (Zizi Goschin, Daniela L. Constantin, Monica Roman, and Bogdan Ileanu, "Specialisation and Concentration Patterns in the Romanian Economy," *Journal of Applied Quantitative Methods 4,* no.1, (Spring 2009)*:* 95-111, p.100).

in the first place, the constant growth of the third sector within these economies – throughout their transformation in service-based economies[79]. The service industry is indeed for its inherent nature more dispersed and less dependent from geographical endowments than the others. Secondly, a generalised reduction of transportation costs and an increase of congestion costs. As pointed out by Daniele et al., during this phase of the industrialisation process, industrial concentration eventually decreases also due to "location diseconomies and congestion costs [that] work as centripetal forces and [due to] technical know-out spreading" [80].

The pursuing of industrial strategies based on scale economies is therefore, at this stage, progressively less common. People employed in the third sector are dislocated more uniformly all over the country's territory. The regional occupational structure becomes more similar to the national one. The industrial apparel of these countries, throughout its three sectors, ultimately assumes a full-fledged national dimension, abandoning the patchy regional or city-based production structure.

Does the modification of the spatial characterisation of the industrial tissue also determine variations of the household income inequality levels in the countries analysed?

As mentioned above, the Kuznets' formulation has a strong spatial component. There is in effect, evidence for many of the countries object of this research of a parallel movement of the two trends. Concurrently with the progressive growth of the GDP per capita, inequalities raise during the take-off of the industrialisation wave and its first phases. Then progressively follow the same descending path as for the industrial concentration level. This trend is observable until the 1970s for the Western high-income countries and until the 2000s for the Latin-American and East-Asian countries here analysed. From these benchmark points, the two trends diverge.

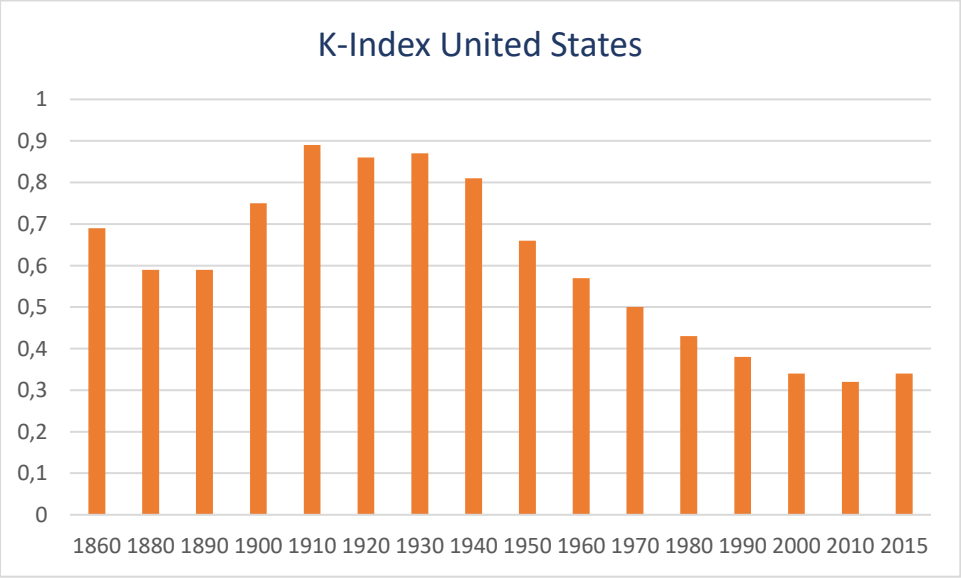
[79] Gary Akehurst, and Jean Gadrey, *The Economics of Services* (London: Frank Cass, 1989).

[80] Vittorio Daniele, Paolo Malanima, Nicola Ostuni, "Unequal Development. Geography and Market Potential in Italian Industrialisation 1871-2001," *Regional Science Association Journal* 97, no.3 (August 2018): 639-662, p. 9.

2.1. The United States

Between 1860 and 2015, the United States pattern for industrial concentration can be described as bell-shaped. The degree of industrial convergence (as a country average) increased between the 1880s and the Interbellum years (1919-1939), and reached a peak in the 1930s. Afterwards, the U.S. became more and more de-specialised, concurrently with the increasing importance of the services sector: "at any given point in time, the traditional, low-tech industries such as textiles, apparel, and tobacco were much more localized than the medium- to high-tech industries such as electricity, transportation, and so forth; consequently, the gradual shift in manufacturing from low-tech to high-tech industries contributed to the general dispersal of manufacturing over time"[81].

Graph. 2. Krugman Index for the US, 1860-2015.



Note: In this figure, I combined my calculations from IPUMS (2020) for the range 1990-2015 with Kim's results (1995) for the range 1860-1980

[81] Sukkoo Kim, "Spatial Inequality and Economic Development: Theories, Facts, and Policies," working paper n. 16, 2008, p.15.

The values for industrial concentration decreased after the 1860s. Significantly, after the end of the Civil War – likely indicating a flattening of the industrial differences between the states of the South and of the North. Furthermore, as argued by Kim, "the integration of U. S. regions proceeded rapidly after 1860. The national railroad mileage in operation increased sharply from 30,626 to 166,703 miles between 1860 and 1890. In 1860 railroads were regional systems often with their own particular track gauges-there were at least seven different track gauges in operation with sizes ranging from 4'3" to 6'0". But by 1890 most railroad lines had converted their tracks to a standard gauge of 4'8.5"[82] .

Essentially, following Krugman's theoretical framework, from the 1860s until the 1890s, the transportation costs continuously decreased. As a consequence, de-specialisation trends were fostered. At the same time though, concurrently with the United States going between 1860 to 1914 "from being a predominantly agrarian economy to being the leading industrial producer in the world"[83], the emergence of economies of scale and the growing importance of localised resource endowments determined an acceleration towards regional industrial specialisation dynamics. Industrial specialisation reached thus a first peak in the 1910s, and then decreased starting from the 1920s – even though, concurrently with the crisis of 1929, it gained again some momentum. However, from the 1940s the level of industrial concentration has been then decreasing without interruptions until the 2010s. The inversion in the trend from the 1940s, can be again framed in the context of Krugman's theorisation: "as factors became increasingly more mobile and as technological innovations favoured the development of substitutes, recycling, and less resource-intensive methods over the twentieth century, regional resource differences diminished. The growing similarity of regional factor endowments and the fall in scale economies caused regions to become de-specialised between World War II and today"[84].

[82] Sukkoo Kim, "Economic Integration and Convergence: U.S. Regions, 1840–1990," *Journal of Economic History* 58, no. 3 (April 1998): 659–83; p.885.

[83] *Ibid.*, p.896

[84] I*bid*., p. 902

The household income inequality level[85], at the same time, followed a very similar pattern. The (first) Kuznets' wave for the US reached a peak firstly around the 1860s and then, after a reduction, again in 1933. Afterwards, the curve was descending until the 1970s[86]. Basically, the industrial concentration trend followed the Kuznets' curve. From the 1970s, the GINI coefficient had instead a divergent trend: whereas industrial concentration was still declining, the household income inequality level began to increase[87]. The two patterns maintain their directions until the period ranging between 2010 and 2015. In these years, immediately after the financial crisis of 2008, there was a progressive increase of the percentage weight, within the national occupational structure, of the financial service and of the business service sectors. The former went from 4.44% in the 2000s to 4.47% in the 2010s. The latter went instead from 6.96% in the 2000s to 12.08 % in the 2010s. These increments did not have a clear reflection in the industrial concetration value at the country level for the 2010, which once again confirmed the descending trend. Nevertheless, the trend of industrial concentration that had been continuosly decreasing for the US since the Interwar years, suddenly had an upturn in the year 2015. In Chapter 4, I will analyse this value within my interpretation of the temporary increases of the industrial concentration, resulting from the adoption of scale economies policies at the firm and country level as a response to conjunctural economic crises.

2.2. Canada

As mentioned in the introduction, the trend for industrial concentration found by Midelfart-Knarvik et al.[88] for Europe (see Tab. 3 in the Appendix) is convergent with the trend of income inequality between 1980 and 1990. Whereas the US have a continuously descending trend for industrial concentration in the time range 1940-2010, for Canada I find an upturn as well in the 1980s. Therefore, in the same benchmark decade as for Midelfart-

[85] Based on Milanovic's calculations in Branko Milanovic, "The inequality possibility frontier: the extensions and new appliacations," *Comparative Institutional Analysis Working Paper Series* 13, (2013).
[86] *Ibid.*, p.10

[87] See graph 3 in the Appendix.
[88] Karen Helene Midelfart-Knarvik, Henry G. Overman, Stephen J. Redding, and Anthony J. Venables, "The Location of European Industry," report for the European Commission, 2000, p. 472.

Knarvik et al. (see Tab. 4 in the Appendix). Nevertheless, from the 1990s, the figures become again decreasing until 2011. In Chapter 3, I will argue that this temporary inversion of the trend for Canada can be in principle associated to the effect of the oil crisis of 1973 on productive strategies at the country and firm level.

Canada, in the time range analysed, 1971-2011, became progressively more integrated with the extra-US markets. In the same way as for many South American economies throughout those years[89] (see also the paragraph on Brazil below), tariffs on trade were increasingly cut. Under the umbrella of the General Agreement on Tariffs and Trade (GATT) – outcome of the "Tokyo Rounds" discussion on liberalisation through GATT – and of the North American Free Trade Agreement (NAFTA), liberalisation policies were extensively adopted at the national level. As pointed out by Brown, "there is, of course, a close theoretical link between trade liberalization and industrial specialization at the national scale: trade liberalization should increase the size of those industries that have a comparative advantage in world markets and decrease the size of those that have a comparative disadvantage. In short, increased trade should lead to greater industrial specialization"[90]. This is, in short, what would have been expected within a Heckscher-Ohlin equilibrium. Namely, a general incentive to shifting the production towards those sectors that were more competitive (due to geographical or technological input factors) within a globalised scenario. In effect, the numbers for industrial concentration grew between the 1970s and the 1980s, after the Tokyo Round agreements (which were discussed between 1973-1979), but already from the 1990s they turned steadily descending.

How to explain therefore the limited effect of the liberalisation policies on Canadian industrial concentration figures?

In the first place, Canada, far from being a unitarian bloc in terms of economic production, was instead a conglomerate of regional economies, with different industrial apparels and different degrees of relationship with the US and the other extra-American markets [91]. In

[89] See the cases of Colombia and Mexico described by Attanasio et al. (Orazio Attanasio, Pinelopi K. Goldberg, and Nina Pavcnikc, "Trade reforms and wage inequality in Colombia," *Journal of Development Economics* 74 (August 2004): 331– 366)

[90] Mark Brown, " Trade And The Industrial Specialization Of Canadian Manufacturing Regions, 1974 To 1999", *International Regional Science Review* 31, no. 2 (April 2008): 138–158.

[91] *Ibid.*

particular, as it emerges from my analysis of IPUMS, the values of industrial concentration for the West and North-West territories (the most involved in the export trade at a global level[92]) had an upturn during the 1980s and then were steadily high until the 2000s. On the other hand, the eastern and central regions had an upturn in the 1980s, but then from the 1990s, had decreasing values. Industrial concentration strategies, therefore, were adopted as a reaction to the liberalisation agreements only in a limited portion of the Canadian territory.

A second aspect that has to be included in the analysis is an assessment of the structure of the demand. In particular, in terms of location of the industries involved in the cycle related to circular demand dynamics. As argued by Brown and Anderson[93], intra-industry trade on the Canadian soil was on the rise from the 1980s, resulting from decreasing transportation costs and from the increasing ties of the overall set of Canadian regions with the US – as an effect of the introduction of the NAFTA agreement. The growth of the inter-regional trade gradually fostered de-specialisation trends at the country level.

Finally, a third decisive element – following the original Kuznets' hypothesis – is the structure and weight of population movements towards the manufacture centres and from the urban centres towards the suburbs. With regards to the rural-urban migration flows, my analysis reveals at the country level a reduction of around 3% of the labour force employed in "Agriculture, fishing, and forestry" between the 1970s and the 1980s. At the same time, the percentage of people employed in "Mining and extraction" and in "Wholesale and retail trade" increases by around 2% each. These two sectors typically have a higher tendency to concentration of the activities due, to the reliance on the geographical endowment for the former and for the positive scale economies for the latter. The mining sector eventually went back to its initial value during the 1990s, whereas the Wholesale sector was stable at the value of 1980 until the 2010s, when it decreased to the level of the 1970s.

With regards to the urban-suburban flows, this path of migration was enhanced by decreasing transportation costs (in terms of highways and railways expansion and easier access to them), by the adoption of mass-production techniques (which are best appliable in the suburbs

[92] *Ibid.*

[93] Cf. Mark Brown, and William P. Anderson, "Influence of industrial and spatial structure on Canada-U.S. regional trade," *Growth and Change* 30, no.1 (1999): 23-47.

areas), and due to the expansion of the US frontier suburbs, after the signing of NAFTA agreements in the 1990s[94].

All these factors have contributed, throughout the decades after the 1980s, to a process of de-specialisation of the industrial activities at the country level (whereas certain regions, such as those on the Atlantic side continued to have higher levels of specialisation until the 2010s).

2.3. Europe

Does industrial concentration for Europe have an upturn during the 1970s, consistently with Milanovic's theory on a second Kuznets' wave starting in those years?

As seen in the introduction, Midelfart-Knarvik et al. have proposed a comparison between Europe and U.S., from an integrated perspective. Their values for industrial concentration are calculated on a country to continent basis. Thus, by calculating the distance from the average of the single countries' values to the cumulative European values. In the present research, instead, Krugman values are obtained on a region (NUTS1) to country basis.

As for the U.S.' specialisation pattern described by Kim, also Midelfart-Knarvik et al. attribute to high-tech and high-growth industries the boost towards an increase in industrial divergence: " […] the econometrics paints a quite robust picture of the changing interaction between factor endowment and economic geography determinants of location. The results indicate an increasing importance of forward linkages and of the availability of skilled labour and researchers in determining the location of industry from 1980 onwards"[95]. Nevertheless, the reasons of the divergence between the U.S. and European trends for industrial concentration from the late 1980s are still not clear[96].

The pattern found by Midelfart-Knarvik et al. for the averaged Europe – bell-shaped until the 1970s but then with an increasing turn from the 1980s – *is not clearly reflected in the*

[94] *Ibid.*

[95] Karen Helene Midelfart-Knarvik, Henry G. Overman, Stephen J. Redding, and Anthony J. Venables, "The Location of European Industry," report for the European Commission, 2000, p.477.

[96] Sukkoo Kim, "Spatial Inequality and Economic Development: Theories, Facts, and Policies," working paper n. 16, 2008, p.17.

performances of the single European states emerging from my analysis of the IPUMS datasets. *The prevailing pattern that I have found follows, on the contrary, the same path as the one assessed for the US*. *Namely, decreasing in the medium run, from the 1940s until the 2010s*.

The UK, Spain, Italy, (as well as Sweden[97], Belgium, and the Netherlands[98]), all follow patterns similar to the US for industrial concentration and income inequality (I report my results from the IPUMS datasets and from the previous literature in Tab. 2 in the Appendix section). France and Germany have an upturn in the 1990s, after having been decreasing until the 1980s. This trend apparently resembles the one prospected by Midelfart-Knarvik et al. Nevertheless, the similarity is reduced to the sole 1990s. In the same way as for Canada, the trend that I found for the subsequent decades is again descending.

2.3.1. The UK

The industrial concentration figures for the UK show a bell-shaped curve with a peak in the Interwar years and a descent until 2011. On the contrary, the figures for income inequality, in line with the US and Canada's results, after having been descending since World War II show an increase from the 1970s. Despite generally lower absolute values than the US (but more similarly to Canada), the long run trends for the UK and for the US of industrial concentration are essentially compatible.

The reduction of transportation costs and the decline of those sectors more related to geographical endowments (for example mining or fishing) and proximity externalities (for example, wholesale) is on the basis of the progressive and steady reduction of the numbers for industrial concentration.

From the 1930s, the percentage of people employed in agriculture and fishing all over the national territory decreased. The reduction in the numbers for these sectors is rather

[97] Cf. Thor Berger, Kerstin Enflo, and Martin Henning, "Geographical location and urbanisation of the Swedish manufacturing industry, 1900–1960: evidence from a new database," *Scandinavian Economic History Review* 60, no.3 (November 2012): 290-308.

[98] Cf. Robin Philips, "Continuity or Change? The Evolution in the Location of Industry in the Netherlands and Belgium (1820 – 2010)," (PhD diss., Amsterdam University, 2020). Belgium and the Netherlands have the same bell-shaped pattern with a peak in the Interwar years.

dramatic between 1921 and 1939: "In the south and northeast of England and the southwest of Wales, the share of employment in the primary sector had been approximately 50% in 1921. By 1939, these same regions – Wales, Northumberland, Norfolk and Kent – show the primary sector by then employing between 10-20% of the labour force. For some regions in the southwest of Wales such as Carmarthenshire, the share of employment declined to below 10%"[99]. At the same time, also the secondary sector faced in many areas (in particular in the "Manufacturing Belt", located in an area that went from Lancashire through the Midlands to the south of England) a broader downsizing. The tertiary, on the contrary, begins from this phase to expand without interruptions until the 2010s.

The Krugman value that I obtained with Philips et al[100]. for the 1940s, with the examination of the UK census register of 1939, reflects these trends. The sudden drop in the level of industrial concentration in the years immediately preceding WWII, though, is more pronounced than in the contemporary series for the US and Spain. The reasons behind this movement are not clear, and more research should be devoted to this issue. The 1939 National Register is a substitute for the official census register of 1931, which was destroyed during the war; moreover, the 1941 census was cancelled due to the ongoing war. Therefore, whereas the descending trend after the peak in 1920 is in line with the results of the other countries, it is at the same time possible that its weight is not fully reliable – namely, a reduction of the value for industrial concentration of almost 30%. We argue[101] that, due to the modalities through which the survey was implemented – the Register surveys were realised just in one day – certain groups are undoubtedly underreported. It is also possible that immediately before the war, many industries and services had been more extensively displaced on the UK territory under a government impulse[102]. A third explanation is related to the different degree of resilience to shocks of the UK regions. Martin et al.[103] have examined the changes in the regional specialisation structure of the UK after four main shocks

[99] Robin Philips, Matteo Calabrese, Robert Keenan, and Bas van Leeuwen, "The regional occupational structure in Interwar England and Wales," unpublished paper, 2019, p.12.

[100] *Ibid.*, p.8

[101] *Ibid.*, p.5

[102] *Ibid.* This has been demonstrated true, for example, for people employed in the military and bureaucracy service

[103] Ron Martin, Peter Sunley, Ben Gardiner, and Peter Tyler, "How Regions React to Recessions: Resilience and the Role of Economic Structure," *Regional Studies* 50, no. 4 (February 2016): 561-585.

1974-76, 1979-83, 1990-93 and 2008-10. They find firstly, that for the period 1971-2014, with the exception of London area, the general industrial structure of the UK had become progressively more similar. Secondly, by analysing the costs and benefits of the UK regional industrial clustering, they find that the negative cost of economies of scale and circular causation of the demand come from the lower resistance to economic shocks of clustered industrial areas, since a more diversified industrial tissue has a greater probability to be able to prevent a generalised spread of the risk. They argue indeed that "the relative role of industrial structure and region-specific effects has varied from one recession-recovery cycle to the next. […] Second, it is also evident that, for the most part, the effect of industrial structure has been what one would expect: namely, that the effect has been negative in those regions – the North East, North West, Yorkshire Humberside, the West Midlands and East Midlands – that have been relatively more dependent on manufacturing, and positive in the more southern, less industrial, more service-orientated regions – the South East, London, the South West and Eastern region [..] But thirdly, what is particularly striking is the relative contribution of region-specific effects to the differential responses of regions to recessions and recoveries. In almost all cases the regional effect exceeds the industry mix effect. In some instances, the regional 'competitiveness' effect has also changed significantly over time" [104].
By following Martin et al.' theoretical findings, it is possible to hypothesise that the economic shock of the crisis of 1929 had catalysed a process of industrial de-specialisation. Essentially, a strategy pursuing economies of scale in this phase had become not sustainable, due to the high costs of the crisis (I will discuss more extensively this theme in Chapter 3.3). Notably, in those regions more dependent on manufacturing (especially textiles), such as Lancashire[105].
Ultimately, it is interesting to note that the trend for the level of income inequality, during the 1930s decade, has been reconstructed by Milanovic[106] as continuously descending for the UK. For the US, instead, there is a temporary increase in the level of inequality during this

[104] *Ibid.*, p.22.
[105] Robin Philips, Matteo Calabrese, Robert Keenan, and Bas van Leeuwen, "The regional occupational structure in Interwar England and Wales," unpublished paper, 2019, p.18.
[106] Cf. Branko Milanovic, "The inequality possibility frontier: the extensions and new appliacations," *Comparative Institutional Analysis Working Paper Series* 13, (2013), p.12.

decade. The destruction of the 1931 census dataset, though, makes again the assessment of the income level for the 1930s decade not fully reliable[107].

2.3.2. Spain

The patterns of industrial concentration and income inequality that I find for Spain, in line with Betran and Tirado et al.[108], have the same progress as for the US. Is this similarity ascribable to common determinants, net of the obvious differences in terms of countries' size and of the respective absolute GDP growth values?

Again, one of the main factors to be assessed is the level of transportation costs throughout the period of reference. As analysed by Betran[109], the railway network, in Spain, had been progressively expanded from the beginning of the Twentieth Century, with a consequent positive spill-over effect on industrial inter-regional de-specialisation. Afterwards, between the 1960s and the 1980s, a wave of public investments in infrastructures had a prominent role in a further reduction of transportation costs.

Other similarities in the US and Spain cases can be found in a common tendency to protectionism between the end of 1800 and the First World War, and in the wide gap between the industrialised core and the rural periphery. With regards to the latter, what emerges from the historical series examined by Betran – I use her series for the years before 1981, first year available for Spain in IPUMS – is that GDP per capita growth, industrial concentration, and income inequality followed a common pattern, as for the US until 1970. Regions such as Catalonia, Madrid, Valencia, and the Basque Country became centres of attraction for the rural population. Their shares for specialised industries increased steadily until the Interwar years. Catalonia manufactures for textiles, Madrid's service sector, Basque Country's steel

[107] Indeed, for Milanovic the value for 1930 is not calculated per se but extrapolated from the overall trend (*Ibid.*)

[108] Cf. Daniel A. Tirado, Elisenda Paluzie, and Jordi Pons, "Economic Integration and Industrial Location: The Case of Spain before World War I," *Journal of Economic Geography* 2, no.3 (July 2002):343–63; Concha Betran, "Regional specialisation and industry location in the long run: Spain in the US mirror (1856–2002)," *Cliometrica* 5, no. 3 (October 2011): 259-290.

[109] *Ibid.*

production, all contributed to the growing numbers for industrial specialisation[110]. At the same time, the level of income inequality raised, as prospected by Kuznets, due to the increased weight of the urban share within the income distribution – namely, the most unequal. Afterwards, in the time period 1940-1970, both the trends for industrial concentration and income inequality decreased, again as predicted by Kuznets' hypothesis. Nevertheless, as for the US, from the 1970s the two trends eventually diverged.

One of the most striking characteristics of Spain's series is that, concurrently with the raising social inequalities in the 1980s, the shares of people employed in manufactures is continuously declining until the 2010s (going from 30% of 1981 to 12% of 2011). At the same time, the primary sector is stable whereas the service sector grows in total around 2% – considering the average of "Financial services and insurance", "Public administration and defense", "Business services and real estate", "Education", "Health and social work", "Private household services", and "Other services". Also, the weight of the group NIU (those people out of the labor force) did not grow throughout those years. Therefore, on the one hand, the widening of income inequalities during this phase did not have a reflection in the reduction of the share of people employed in the primary sector, as in the early stages of the industrialization process – and consequently, in the periphery-to-core migrations of population on the basis of the widening of the urban-rural income gap. On the other, the augmented weight of the service sector is consistent with Milanovic's thesis[111] that the growth in social inequality has been led by the growth of the income share of people employed in this sector – even though, in Spain, the share of "Financial services and insurance" is in a countertrend: it decreased from 2.80 % in 1981 to 2.37 % in 2011. I will return on these findings in Chapter 3 and 4, when discussing the possible existence of a second Kuznets' wave in the Western world, as theorized by Milanovic, beginning from the 1970s.

[110] *Ibid.*
[111] Cf. Chapter 4.

2.3.3. Italy

Italy follows the same patterns for industrial concentration and income inequality as for Spain, the UK, and the US throughout the time period 1860-2010. Nevertheless, the Krugman values are constantly higher than all the other countries I have analysed in the present research (including those in the East Asia and South America areas). This discrepancy in the magnitude of the trends can be entirely ascribed to the difficulties for Italy to become an integrated market at the country level, since its unification in 1861[112].

All over the period ranging from 1860 to 1960, the Italian transportation network was on average underdeveloped[113]. Moreover, the wave of public investments in infrastructures between the 1950s and the 1970s, although increasing the interconnectivity of the road and railroad networks at the country level, did not ensure a complete integration between the regions of the north and those of the so called "Mezzogiorno d'Italia" in the South[114]. These limitations of the transportation system affected the markets and the structure of the industrial apparel in different ways throughout the stages of the industrialisation process. As described by Daniele et al, "in a pre-industrial economy, […] , where the scarcely developed transportation system implies high trade costs and where the structure of production is based on small craftsmanship, industrial activities tend to be scattered. Proximity to domestic demand is important in order to minimise transport costs. In such an economy, the location of industry depends on "first nature" factors, that is natural resources and on the size of local markets" [115]. This is the starting point of Kuznets and Krugman's models. By following Milanovic's theoretical framework, Italy was at that stage an agrarian society subject in the long run to a regime of fixed average incomes. The broad 'periphery' was characterised by low income levels; the soon-to-be industrialised 'core' instead, by higher income levels. The take-off of the industrialisation was then the catalyst for migration movements of population

[112] Cf. Anna Missiaia, "The industrial geography of Italy: provinces, regions and border effects (1871–1911)" (PhD diss., London School of Economics, 2015); Vittorio Daniele, Paolo Malanima, Nicola Ostuni, "Unequal Development. Geography and Market Potential in Italian Industrialisation 1871-2001," *Regional Science Association Journal* 97, no.3 (August 2018): 639-662.
[113] *Ibid.*
[114] *Ibid.*
[115] *Ibid.*, p.8.

from the former to the latter, with the consequent increase of the level of income inequalities. The areas that became the industrialised core were those which had easier access to markets, to the row material endowment, and to the recruitment of the labour force. Over time then, other manufactures tended to settle around the original industrial core, due to the presence of forms of circular demand and economies of scale. In the case of Italy, the core area of the industrial revolution beginning at the end of the Nineteenth Century was the so called "triangolo industriale". Namely, a territory forming a triangle whose vertices were the cities of Genoa, Milan, and Turin. Essentially, until the 1950s, this was the only industrialised area in Italy, with the whole South remaining mainly agrarian. In this respect, Italy represents again an unicum among the series analysed: the industrial concentration figures appear as having less oscillations during this time frame, with the Krugman values being steadily around 0.9 – even though there is a gap in the data for the Interwar years in Daniele et al.' series which make the comparison harder.

Between the 1950s and the 2010s, the industrial concentration trend eventually decreased, concurrently with a reduction of the GINI coefficients. The income inequality trend was as well descending, despite several oscillations, until the first half of the 1980s. From that point, it turned to be steadily growing. During this period, public and private investments were addressed also to the regions of the South (even though several southern regions such as Basilicata, Calabria, Abruzzo, and Molise were not fully involved in this process[116]). The occupational structure of the South, especially in terms of people employed in manufactures, became more similar to that of the North. At the same time though, the decline of the industrial concentration figures was slower and the absolute value higher than for the other countries analysed. The mentioned persistence of a not fully operational transportation network, and the differences in investments for certain regions in the South explain only partially the trend.

How to explain the persistence of high values for industrial concentration also in this phase?

In the first place, a role was played by the expansion of the manufacture export sector between the 1960s and the 2000s – it went from 20% of GDP in 1920 to 55% in the second

[116] Vittorio Daniele, Paolo Malanima, Nicola Ostuni, "Unequal Development. Geography and Market Potential in Italian Industrialisation 1871-2001," *Regional Science Association Journal* 97, no.3 (August 2018): 639-662.

half of the 2000s[117]. This type of industry has higher returns from scale economies and clustering strategies, since its higher reliance to market accesses – I will analyse in the following paragraphs, for the East and South Asian economies, and for the South American ones, the set of policies based on these clustering strategies and issued by those governments during the 1980s, addressed to protect and to enhance the export industry.

Secondly, a further factor to be taken into account is the strong presence of migration flows from the South to the North. "In 1981 between 16 and 26 percent of the population of Abruzzi and Molise, Campania, Apulia, Sicily and Sardinia and between 31 and 42 percent of Calabria and Basilicata lived outside the regions where they were born"[118]. Many of those migrants were employed in the manufactures of the North[119] – at least those that were in the labour force. Considered within a Kuznets' framework, these movements were inevitably leading towards forms of industrial concentration as well as to an increase in the income differences between the two areas – counterbalanced by the process of industrialisation of the South. In effect, despite the income inequality index decreased throughout the period 1950-1980, and although in the subsequent decades the inequality increment was inferior in percentage compared to that of other high-income countries, in Italy persists a very unequal income distribution until nowadays. In 2008, indeed, Italy ranked only 17th in the list of the most equal countries in the high-income group[120].

2.3.4. France

The decades available for France on IPUMS cover from the 1960s to the 2010s. As for the other Western countries, the trend for industrial concentration is overall declining in this time range. Nevertheless, in the 1990s there is an upturn of 0.1 in the Krugman Index. As mentioned above, this number is in line with the results of Midelfart-Knarvik et al. for the integrated Europe. They find for France, compared to the European average, increasing values

[117] *Ibid.*
[118] *Ibid.*, p.13.
[119] *Ibid.*
[120] Andrea Brandolini, "Income Inequality in Italy: Facts and Measurement(La disuguaglianza dei redditi in Italia: fatti e misure)," *Banca di Italia Statistics*, (2008), p. 66.

for industrial concentration in the period between 1988 and 1997 (see tab. 3 in the Appendix). However, my findings from IPUMS (in line with Dormard[121]) reveal that the increasing trend found by Midelfart-Knarvik et al. was just temporary. As for all the other Western countries, the figures from the 1990s are afterwards always descending.

How to explain then this oscillation?

In the first place, between 1980 and 2000 the figures regarding the shares of regional and provincial GDP of national GDP indicate that there were compensation movements within regions and provinces in terms of GDP shares. For example, whereas the region of Paris kept stable its share of national GDP (at around 40%), its province Ile-de-France went from 27 % to 28.6 % of the share, at the expenses of the other provinces of this area[122]. At the region level, the GDP shares decreased for the Northern and Eastern regions while increasing in the Western and Southern regions. In parallel with the provincial and regional GDP trends, the figures for employment tended to increase and decline in the same areas. And consequently, as it is visible from the levels of provincial specialisation, the level of industrial concentration was increasing as well. For Ile de France, the Krugman value that I find goes indeed from 0.23 in the 1980s to 0.27 in the 1990s. However, in the 2010s the value goes back to 0.26. The decline was mainly attributable to the reduction of the employed people in the Manufacture and in the Business sectors.

The increment throughout the 1990s in the Manufactures has been explained by Dormard also as depending by state interventions towards the concentration of "innovations activities": "[…] in 1997, almost 42.3% of expenses for public civil research were concentrated in Île-de-France (OST 1997), followed at very great distance by the regions Rhône-Alpes (10.8%), Midi-Pyrénées (9.6%), Provence-Alpes-Côte d'Azur (8.3%). Concerning the expenses for research and development made by the enterprises, the concentration is even stronger, as Île-de-France comprises 52.6% of these expenses compared to only 9.9% for Rhône-Alpes, 5.7% for Provence-Alpes-Côte d'Azur and 4.7% for Midi-Pyrénées"[123]. The fierce competition of the

[121] Serge Dormard, "Economic development and regional disparities in France," in *Employment and regional development policy: Market efficiency versus policy intervention*, ed. Karl, Helmut Rollet, Philippe (Verlag der ARL – Akademie, 2004), 50-67.

[122] *Ibid.*

[123] *Ibid.*, p.55

other European countries was then able, in the following decades, to reduce the weight of this sector throughout the second half of the 1990s and the 2000s[124].

In the second place, as for Italy, a role in the process of increasing regional specialization during the 1990s was played by the export industry. Notably, by those manufactures specialized in high technology artifacts[125]. Often, they were located in the above mentioned districts where the state was fostering "innovation activities". The shares of "Wholesale trade" activities that I find at the national level have indeed an increment of 0.2 percentage points between the 1980s and the 1990s. Then, in the 2000s, they have a reduction of almost 0.4%, concurrently with the downsizing of this sector due to the globalised competition of the South East Asian economies (as I will discuss below).

Finally, peculiar demographic and migration dynamics had a role in determining on the one hand, the push towards industrial concentration during the 1990s. On the other, the oscillations of the GINI coefficients between the 1980s and the 1990s. At the beginning of this phase, there was an increment of the population in the Western and Southern regions that was partially absorbed, throughout the migration flows for working reasons towards the region of Paris. This process, again in a Kuznets and Milanovic's perspective, increased the income disparities between the periphery and the core. In 1984, after being on the rise since the 1970s, the GINI coefficient reached the value of 36.9. This is the highest value in the time period ranging from the end of World War II to nowadays. Nevertheless, already in 1989, the value is at 32.2. This rapid decline is explained firstly, by the above mentioned good economic performances of the Western and Southern regions during the second half of the 1980s and throughout the 1990s. Secondly, by the low levels of population growth in regions such as Ile of France, which rebalanced the previous migration flows.

Before analysing the case of Germany, which has similar trends for industrial concentration and income inequality, it is interesting to note that France is the only European country that had a growing value for industrial concentration in the 2010s. This value, as I discuss more extensively in Chapter 4, can reflect a reaction to the economic shock resulting from the 2008 financial crisis. In the same way as for the US, but on the contrary of Canada, Spain, and Italy

[124] *Ibid.*
[125] *Ibid.*

(there is no data for the UK), in France the years after the crisis were characterised by a tendency to concentration of the financial and business sectors at the country level. The process, as seen above, becomes evident for the US during the first half of the 2010s. A period of time that can be analysed thanks to the availability on IPUMS of census data from 2015 for the US. Nevertheless, the absence of data for the years after 2011 for all the other countries analysed makes the process of comparison, at this stage, not possible.

2.3.5. Germany

As for France, the 1990s are a decade of growing regional specialisation also for Germany. This upturn would appear, at first sight, rather contradictory in a decade which began with the unification of Germany, after the fall of the Berlin wall in November 1989. Even just taking the falling transportation costs resulting from an event of this type, de-specialisation dynamics should have been triggered. However, once again, it must be considered that the state of facts depicted in the census survey is more related to the events and policies of the decade prior to the one in which the survey is implemented. Indeed, the concentration value eventually decreases for the 2000s[126].

How to explain in this case the temporary oscillation of the Krugman value towards increased concentration?

The decades available on IPUMS for Germany are very limited: only the 1970s and the 1980s. The values for the 1990s and the 2000s are instead taken from Suedekum' series.
Germany, until 1989, was divided in two entities with different business approaches at the state level. Notably, East Germany, within the Soviet Bloc, had a much stronger tendency to "artificial levels"[127] of industrial concentration, fostered by the state planners of the time. West Germany, instead, was more on the common path analysed above for the countries from the high income group. However, both Germanies, between the 1970s and the 1990s

[126] My results on the declining trend of de-specialization between the 1990s and the 2000s for Germany are in line with Suedekum (Jens Suedekum, "Concentration and Specialisation Trends in Germany since Reunification," HWWA Discussion Paper Hamburg Institute of International Economics (HWWA), Hamburg. no. 285, (2004): 1-35).

[127] *Ibid.*

went through those de-specialising processes – such as a general reduction of transportation costs, rising congestion costs, know-how spreading – that I have analysed for the other Western countries. The exceptionalism of Germany definitely lies in the re-unification event. The census survey of 1987 from IPUMS reveals that the percentage of people employed in manufactures in the whole Germany had decreased of 4 percentage points compared to the 1970s. On the contrary, all the service sectors had increased of around 1 to 2 percentage points compared to the prior decade. As mentioned above, the transition towards a service-economy is one of the main catalysts towards the de-specialisation of regions. These figures, though, have a sudden change in 1993 (year of Suedekum's data[128]), during the first years of the re-unification. People employed in manufactures grew again, concurrently with a reduction of the individuals employed in the primary sector and the expansion of East to West migration flows. The service sector figures (with the exception of the employed in the Public service sector, which were decreasing) on the other hand, were stable. These figures closely resemble the early conditions at the beginning of a Kuznets' wave, with the typical movement from the periphery to the industrialised core, and with the consequent reduction of the percentage of people employed in agriculture. Furthermore, the GINI series – which was on the rise since the 1970s – had a further upturn during the time period 1992-1995, before first reaching a plateau and then, even temporary decreasing until 2005 – since then, income inequality is steadily increasing, in line with the other Western high income countries.

2.4. The East-Asian miracle

For the countries of the "East-Asian miracle" analysed in the present research (with the exclusion of Thailand), the 1970s are the decade of increasing industrial concentration. The following decades have instead a more or less rapidly descending trend. An upturn in the values is then visible from the 2000s, concurrently with the financial crisis of 1997 – about the theoretical insights that I extrapolate from the figures for the 2000s, see Chapter 3.3. During this time period (1970-2000), in the early phases of their industrialization process, these "New

[128] *Ibid.*

Industrializing Countries" had, as firstly suggested by the World Bank Report of 1993 on the "East-Asian miracle", a combination of high levels of economic growth and declining levels of income inequality[129]. Therefore, in the opposite direction to what the Kuznets hypothesis would have prospected.

I have confirmed these results from the World Bank somewhere else[130]. Furthermore, I have demonstrated for the three countries of this group – Malaysia, Indonesia, and Thailand – that it is possible to empirically disentangle the effect of the industrial concentration level on the level of wealth inequality[131] from the effect of other variables, such as for example the growth of the economy *per se* or the growth of the population. This econometrical approach has eventually found a negative correlation between regional industrial specialisation and the level of inequality at the region level. Basically, for these three countries, growing levels of industrial specialization have a role (net of the endogeneity effect) in determining the decreasing levels of household inequality in the early phases of the industrialization process.

2.4.1. Indonesia, Malaysia, Thailand

As it is visible in Tab. 7 in the Appendix, the figures for the GDP per capita growth were increasing for Indonesia, Malaysia, and Thailand, throughout the range of time analysed. A slowdown in the rate of growth of the GDP was nonetheless present in the 2000s, immediately after the crisis of 1997. Concurrently with the economic development of these years, the occupational structures of the three countries had similar modifications. On the one hand, the growth of the Wholesale and Business sectors (in line with the vocation to export trade of the countries of these areas) and of the service sector. On the other, the growth of figures for people employed in the first sector, "Agriculture, fishing, and forestry".

[129] Nancy M. Birdsall, Jose E. L. Campos, Chang-Shik Kim, W. Max Corden, Lawrence Mac Donald, Howard Pack, John Page, Richard Sabor, and Joseph E. Stiglitz, "*The East Asian miracle : economic growth and public policy : Main report (English)*," World Bank policy research report, 1993.

[130] Matteo Calabrese, "Industrial specialisation as a determinant of decreasing inequality at the regional level within the "East-Asian miracle" context: the cases of Malaysia, Thailand and Indonesia" (MA thesis, Utrecht University, 2019).

[131] In this case, I used an asset-based index to express the level of social inequality in the country.

These findings are apparently at odds with an interpretation within a Kuznets' framework. As I stressed before, during the early phases of the industrial revolutions, periphery to core migrations have an increase at the same time as the level of industrial concentration and the level of income inequality. A typical sign of this phenomenon is the reduction of the figures for the population employed in the primary sector. In the case of these three countries, though, two further elements must be considered for the analysis. In the first place, by following my interpretation on the "displaced Kuznets' wave" for the East Asian context – which I will discuss more extensively in Chapter 3 – the period from the 1980s to the 2000s must be placed on the declining branch of the Kuznets' curve for Indonesia and Malaysia. However, in line with the findings of the World Bank Report of 1993[132], it is correct to attribute the reprise of the agriculture numbers to "land reform" plans, operated in the same years by the governments of the three countries. State interventions in land redistribution and in formation of human capital endowment are two of the key elements of the "growth through equality" recipe of these East Asian countries, during this phase. The level of income inequality, indeed, was decreasing until the 2000s, when it had an upturn concurrently with the financial crisis of 1997. I have confirmed this trend somewhere else[133] and demonstrated that there is a high correlation (0.71) between an inequality index calculated on the assets owned and the GINI coefficients for the same areas. Furthermore, I have analysed the role that other related determinants have on the variation of the level of income and wealth inequality. As mentioned in the introduction, problems of endogeneity make the process of isolation of the effect of each single variable a rather complicated endeavour. For example, the growth of the urban population has a disequalising effect on the level of inequality. Nevertheless, as seen above, rural-urban migration flows are strictly connected with the overall economic growth and the strategies based on economies of scale adopted at the firm level. Therefore, part of the effect of the urban population variable should be instead attributed to the variables "Economic Growth" and "Industrial Concentration". The same is true for the variables describing the share of IT export and of Foreign Direct Investment.

[132] Nancy M. Birdsall, Jose E. L. Campos, Chang-Shik Kim, W. Max Corden, Lawrence Mac Donald, Howard Pack, John Page, Richard Sabor, and Joseph E. Stiglitz, "*The East Asian miracle : economic growth and public policy : Main report (English)*," World Bank policy research report, 1993.

[133] Matteo Calabrese, "Industrial specialisation as a determinant of decreasing inequality at the regional level within the "East-Asian miracle" context: the cases of Malaysia, Thailand and Indonesia" (MA thesis, Utrecht University, 2019).

Further research should be devoted, though, to the individuation of instrumental variables and identification strategies able to overcome this causal circularity.

Secondly, the case of Thailand represents an outlier in this group. The trend of industrial concentration grew during the first three decades of the reference frame and then decreased from the 2000s. The figures for income inequality, on the contrary of the other countries of the group, were instead growing during the first three decades and then decreasing from the 2000s. In Chapter 3, I will compare this case with those of Brazil and Argentina, and I will argue that it is possible to hypothesise a "displaced" peak of the Kuznets' wave in the 1990s - 2000s for Thailand. Essentially, Thailand was proceeding in its path of industrialisation either more slowly or with some delay compared to the other East-Asian countries. Nevertheless, in order to confirm this hypothesis, an analysis of the census registers from the subsequent decades – once they will be made available – is necessary.

2.5. China

The data available on IPUMS for China range from the 1980s until the 2000s. As for Thailand, also the Chinese trends of industrial concentration and income inequality are increasing until the 2000s. For China, though, it is not possible to conclusively individuate the peak of the Kuznets' wave, due to the scarcity of available data. Furthermore, the peculiar political vicissitudes of this country (which was not included in the group of countries of the World Bank Report of 1993) introduce a series of issues that need to be assessed throughout the analysis.

At the beginning of the 1970s, the famine following Mao's macroeconomic experiments of the "Great Leap Forward" had reduced the population. Nonetheless, during the 1970s, the growth rate of Chinese population became of enormous concern for the public authorities of Beijing. The fears for a potential Malthusian collapse, at the end of the 1970s, prompted Deng Xiaoping to implement a series of "tighten up" reforms aimed at avoiding that outcome[134]. Among those reforms, of particular interest for the purposes of the present research are on

[134] Cf. Ezra F. Vogel, *Deng Xiaoping and the transformation of China* (Harvard: Harvard University Press, 2011).

the one hand, the so called "one child policy" and, on the other, the consequent group of policies related to the weakening of the "hukou" system. Whereas the first was aimed at reducing the birth rate (and therefore the future pressure of the population on the resources), the second was designed as a sort of countermeasure for the prospected employment unbalances deriving from the first.

The hukou system assigned a perpetual agricultural or non-agricultural status based on the initial location registration of the parents [135]. Inter-provinces and even rural-urban movements of the population were significantly hindered by this system. The immediate effect of Deng Xiaoping's reforms was therefore an outburst of migration flows from the periphery to the industrialising cores of the country. At the same time, indeed, China was experiencing a massive and quickly process of industrialisation, resulting from the "great transformation" of Chinese economic and social structures [136]. The GDP was on average growing of 9.8 % yearly from the 1980s, after the liberalisation reforms of the economy in the second half of the 1970s.

The analysis of the census statistics reveals that, from the beginning of the 1980s, in the first place, the figures for Chinese migration flows were on the rise either at the intra-provincial level as well as at the inter-provincial level. Both paths, were mainly following a rural-urban route. Secondly, that the female component among the rural-urban migrants was growing. Women had been traditionally less migratory than men in China [137] until, in 2000, the percentage of women migrating during that year reached 52% - I extrapolated this qualitative analysis of migration flows from a guidance booklet that has been recently made available by the Chinese Census Bureau: "*Women and Men in China. Facts and Figures 2012*", National Bureau of Statistics of China official reports collection (1980-2012).

The increasing migration figures for women can be explained on the one hand, by the increased demand for female workers in the factories of the clustered industrial centres – such as Beijing area, Shanghai, the Shenzhen Special Economic Zone, Hubei, and so on. On the other, by the emergence of 'missing women' phenomena [138]. Namely, by a constant

[135] *Ibid.*

[136] *Ibid.*

[137] Zai Liang, and Yiu Chen, "Migration and Gender in China: An Origin-Destination Linked Approach," *£conomic Development and Cultural Change* 50, no.2 (2004): 423-443.

[138] Cf. Amartya Sen, "More Than 100 Million Women Are Missing," *The New York Review of Books,* December 20, 1990.

process of selection of males at birth that produced, consequently, an unbalanced sex ratio. The reduced number of females, starting from the second decade after the introduction of the one-child policy, played a primary role in the re-shaping and in the magnification of the rural-urban migration flows. Women from the rural side, due to the general decreased number of women, were able to find more easily jobs in the cities and even to get married with "urban husbands". Fan and Huang[139], in this regard, have described a "wave of rural brides", reaching the cities from the countryside, in the years between the 1990s and 2000s.

These peculiar occurrences in terms of migration flows had a role in the determination of the figures for industrial concentration and income inequality. The softening of the hukou system and the greater mobility of women made more convenient for Chinese firms the adoption of economies of scale strategies. Essentially, both phenomena produced a sudden reduction of the recruitment costs – *ceteris paribus* the transportation costs for goods and raw materials. As a consequence, the magnified flows of workers (particularly women, that had traditionally inferior wages compared to men) towards clustered industrial centres became one of the most distinctive tracts of Chinese history during these years[140]. Furthermore, the growth in absolute numbers of the population receiving an 'urban income', whereas the conditions of the agrarian population were pretty much the same throughout the reference period, produced a constant growth of the income disparity at the country level. This is reflected by the increasing trend of the GINI coefficients between the 1980s and the 2000s – again in line with Kuznets and Milanovic's theoretical frameworks.

My analysis of the occupational structure in the IPUMS datasets[141] reveals, indeed, in the first place a stable decrease of the percentage of people employed in the agrarian sector. The fact that in the 1980s still the 73.18% of the population was employed in the primary sector gives an idea of the magnitude of the cumulative income differentials between the rural and urban sides. This percentage became then, in the 2000s, 63.33 %, showing the outcome of 20 years of softened hukou system and industrial development.

[139] Cf. Cindy Fan, and Youqin Huang, "Waves of Rural Brides: Female Marriage Migration in China," *Annals of the Association of American Geographers* 88, no. 2, (1998): 227-251.

[140] Cf. Ezra F. Vogel, *Deng Xiaoping and the transformation of China* (Harvard: Harvard University Press, 2011).

[141] I added in the Appendix all the tables with my calculations for China in the 1980s, as a further example of my approach.

At the same time, it is evident the growth of general manufactures and Wholesale (which is a sign, as explained above, of the growth of the export sector). The service sector was instead rather stable in numbers during the three decades analysed – except the growth of the Education services, which is in line with the expansion of the state investments in education, again part of Deng Xiaoping's reforms during the 1970s and 1980s[142]. The stasis of the financial and business sector is in line with the hypothesis that the transition towards a service-based society was not yet started in China during those years. Therefore, it can be interpreted as a further element towards the thesis that the Chinese Kuznets wave starting in the 1970s had a slower growth than the East Asian economies analysed in the previous paragraph (with the exception of Thailand). Ultimately, therefore, it is possible to affirm that the peak of the bell-shaped curve for industrial concentration had, as of the 2000s, still to be reached in China.

2.6. South America

The 1980s are a benchmark decade also for the two Latin-American countries here analysed, Brazil and Argentina (see Tab. 5 in the Appendix). Brazil for example, during these years, interrupts an increasing trend in the specialisation values which had started in the 1960s, concurrently with a phase of incipient industrialization and a concomitant increase of in-ward migration flows[143]. The figures are then decreasing until the 2010s. During the same period, the income inequality trend is upwards from the 1970s to the 1990s and then declining from the 2000s[144]. The trends for Argentina are instead more oscillatory.

[142] *Ibid.*

[143] Alan Gilbert, and David Goodman, "Regional income disparities and economic development: a critique," in *Development Planning and Spatial Structure*, ed. Alan Gilbert (London, 1976), 113-141, p.129.

[144] Cf. Francisco H.G. Ferreira, "Inequality and Economic Performance," text for World Bank's Web Site on Inequality, Poverty, and Socio-economic Performance, 1999.

2.6.1. Brazil

As for other South American economies – see in particular Colombia and Mexico, analysed by Attanasio et al.[145] – the 1980s are a decade in which a broad plan of liberalisation policies was put in place by the Brazilian government[146]. Tariff barriers were removed alongside the whole territory, and particularly, for the import and export industries. "In 1994 nominal tariffs in the manufacturing sector were, on average, one quarter of their 1988 levels, and one tenth of their 1985 levels"[147]. By referring to Krugman's model, these policies had thus a powerful effect on the reduction of transportation costs. And eventually, they were a catalyst for processes of de-specialisation at the region and country level. In the same way as seen above for Canada, the manufacture export and import sector – which have, as seen, on average greater returns from economies of scale strategies – grew throughout the reference period and often opted for clustering policies. This trend has a clear reflection in the figures for the group "Wholesale and retail trade", which went from 8.46% during the 1960s to 11.54% in the 1990s (and then 15.46% in the 2010s). At the same time, though, the reduction of transportation costs fostered a countertrend of inter-province de-specialisation for the other industries (for example textiles, and automotive[148]) not involved in the import-export trade system, or not fully responding to the change of the tariffs (such as the sugar export). As analysed by Ferreira and Facchini, indeed, "in some industries like "Processed Rice" or "Machines and Equipment" concentration almost doubled, while in others like "Sugar" the concentration index declined to two thirds of its original 1986 value. [Moreover], the regime switch did not affect all sectors to the same extent"[149].

[145] Orazio Attanasio, Pinelopi K. Goldberg, and Nina Pavcnikc, "Trade reforms and wage inequality in Colombia," *Journal of Development Economics* 74 (August 2004): 331– 366.
[146] Cf. Pedro Cavalcanti Ferreira, and Giovanni Facchin, "Trade liberalization and industrial concentration: Evidence from Brazil," *The Quarterly Review of Economics and Finance* 45, no. 2-3 (2005): 432–446.
[147] *Ibid.*, p.2
[148] *Ibid.*, p.13
[149] *Ibid.*

The industrial policies and tariff reduction plans implemented between the 1970s and the 1980s by the Brazilian governments, had also another effect, clearly visible through the occupational structures in the IPUMS datasets. Namely, the quick and broad downsizing of the primary sector, due to the growth of other sectors benefitting from tariffs reductions. The employed population in agriculture, indeed, went from around 52% in the 1960s to 27.74% in the 1980s. This wide relocation of the population from agriculture to other sectors – in particular, to manufactures, that went from 9.29% of 1960 to 16.84% of 1980 – increased the income divide in the country. A role was played also by the two factors of interest analysed throughout the present research: a) periphery to core migrations and b) consequent increase of the more unequal share of the income distribution. The GINI coefficient went from 53 of 1960 to 61 of 1972, concurrently with the peak of the industrial concentration curve. Throughout the 1980s both the trend for income inequality and that for industrial concentration were then descending until the 1990s. After this year, though, the two trends diverged, with income inequality again on the rise; only from the second half of 2000s the two trends became again both descending. I will return on the interpretation of these figures in Chapter 3, when I will discuss the displacement of the Kuznets curve for Brazil and Argentina.

The declining figures for industrial concentration from the 1980s until the 2010s were linked also to the growth of service sectors. Brazil's peculiarity is that the expansion in this tertiary sector was led by the "Education" services. In 1996, it was introduced the FUNDEF (Fund for Maintenance and Development of the Fundamental Education and Valorisation of Teaching); in 2006, instead, it was launched the FUNDEB (Fund for the Development of Basic Education and Appreciation of the Teaching Profession). Both these governmental funds increased in the first place, the number of teachers all over the national territory. Secondly, their salaries. The success of this initiative is revealed by the increasing trend of the figures for Education in the IPUMS datasets. In 1960, the employed population in the Education sector was 1.86% of the total. In the 2000s, it employed 5.9% of the population.

2.6.2. Argentina

For Argentina, the trends of industrial concentration and income inequality are between the 1970s and the 2000s more oscillatory than the average of the other countries analysed from IPUMS. Between the 1970s and the 1980s, a process of de-specialisation is visible in the Argentinian trends. In the 1990s, an upturn towards bigger specialisation[150]. But then an evident fall just in the following decade. The trend for income inequality, that had been descending until the first half of the 1970s, was then essentially increasing (despite a temporary reduction in the first half of the 1980s) until the second half of the 2010s. The GINI coefficient was 35.3 in 1972. In 2003, 52.8. In 2010, 44.49.

The practice of state incentives to trade liberalisation and facilitations to the export industry was taken to an extreme in Argentina, during the years between 1976 (begin of the dictatorship years) and 1999 (last year of Menem's government). Declining transportation costs and increased investments in the education and public services (but to a lesser extent than for Brazil) were pushing towards a decrease of the industrial concentration value, already during the 1970s. At the same time, though, the liberalisation policies counterbalanced and eventually overcame the first effect. "Faithful to the principles of the Washington Consensus, the policy-making authorities trusted implicitly that the spontaneous action of the market forces would bring about the necessary adjustments both at the macroeconomic level (deflation of nominal prices) and in terms of resource allocation (development of sectors with comparative advantages, generalized increases in productivity). The conversion process did not take place either as completely or as promptly as expected, however"[151]. The outcome of these reforms during those two decades, indeed, was the emergence of a set of conditions that represents a unicum among the countries that I have analysed in the present research, for the period 1970 to 2010. On the one hand, the growth of the industrial concentration level. On the other, an impressive decline of the GDP value in

[150] Cf. Carlos Azzoni, Naercio Menezes-Filho, and Taitane Menezes, "Opening the Convergence Black Box: Measurement Problems and Demographic Aspects," in *Spatial Inequality and Development*, eds. R. Kanbur and A.J. Venables (Oxford: Oxford University Press, 2005).

[151] Pablo Sirlin, "Argentina's industrial specialization regime: new-generation industrial policy, or merely a transfer of resources?", *Revista CEPAL* 68*,* no.110, (August 1999): 101-114, p.102.

absolute terms. Namely, a negative growth rate of the GDP. The GDP had indeed a downsizing of almost 22% (source Maddison Project Database) during the 1990s.

As for Brazil, the state investments in the sole export industries, in addition to the increased effect of globalised competition on the national demand (outcome of the lowering of the trade tariffs), produced a severe shock in the traditional manufacture sectors. In particular, textiles, automotive, and other capital goods[152]. My results from IPUMS reveals indeed that the percentage of population employed in manufacture went from 20.19% in the 1970s, to 15.04% in the 1980s, and to 10.12% in the 1990s. This quickly declining progression gives an idea of how much the industrial economic structures were getting weakened in the years before the financial (and economic) crisis of 1998-2001. In line with the state investments and incentives described above, the Wholesale sector grew instead from 13.33% in the 1970s to 17.47% in the 2000s.

Starting from 1992, the Argentinian government, in the hope of reversing the chain of failures among the industries not involved in the export trade, launched a program aimed at protecting those industries. However, the ISR plan (Industrial Specialisation Regime) was flawed by a contradictory dirigiste approach applied in a context of trade liberalisations and continuous promotion of the export activities. For example, among the rules that the firms applying to this program had to respect there were the following:

"Enterprises conclude agreements with the Ministry of Industry on (annual or multi-year) schedules for increasing their exports of specific industrial products. Each enterprise may submit more than one programme and include various products in each of them. In all cases the base year is 1992. The value of the exports is net of imported components. The enterprises become eligible for tariff rebate certificates, in an amount equivalent to the increase in their exports, which allow them to import goods at a differential tariff of 2% and a "statistical rate" of 3%"[153]

The failure of these macroeconomic plans is not only visible in the declining numbers for the manufacture sector during the time period between the 1980s and the 2000s, but also in the impressive numbers relatively to the return to agriculture of the Argentina population. The percentage of population employed in the primary sector went from 13.88% in the 1970s to

[152] *Ibid.*

[153] *Ibid.*, p.108.

around 20.67% alongside the 1980s. The growth of the agriculture sector, besides being a sign of the weakening of the Argentinian industrial apparel, was also likely able to affect the trend of income inequality during the first half of the 1980s. Periphery to core migrations tend to increase the income divide, as seen for the initial phases of the industrialisation process. On the other hand, the effect of core to periphery migrations on the general income inequality level, in a context of decreasing GDP per capita growth rates, is instead ambiguous. Whereas the poverty rate is without doubt on the rise, a generalised lost of income can in principle produce a reduction of the inequalities between the different classes of income receivers. Moreover, the return of capitals can also decrease, and contribute to the general reduction of the income divide – in the same way, as Piketty[154] has analysed for the Western societies involved in the aftermath of World War II. Between 1980 and 1985, concurrently with an increased migration flow from the urban side to the countryside, in effect decreasing GINI coefficients show a progressive reduction of the income inequalities in Argentina. However, concurrently with a reprise of rural-urban migration flows and a worsening of the financial status of the country, the index turned again upwards already in the second half of the 1980s.

In conclusion, the trend for industrial specialisation was strongly determined by long-run governmental effort in this direction[155]. An attempt of reversing the trends during the 1990s far from solving the structural issues of the Argentinian economy, turned to be a complete failure. During the years of the dictatorship regime in the 1980s but also during the years of the presidency of Menem, the state pursued policies aimed at promoting the creation of clustered districts for the export sector. A dirigiste attitude, with the idea that fostering scale economies would have made stronger the whole Argentinian industrial sector and therefore the overall economy. The results of this operation are clearly visible in the values of industrial specialization for the 1990s. Nevertheless, in the 2000s, on the eve of the explosion of the financial crisis in 2001, the value became again low. Lower than prior to the intervention. A

[154] Cf. Thomas Piketty, *Capital in the twenty-first century* (Belknap Press of Harvard University Press, 2014).

[155] Belen Barroeta, Javier Gómez, Prieto Jonatan, and Paton Manuel Palazuelos, "*Innovation and Regional Specialisation in Latin America Identifying conceptual relations with the EU Smart Specialisation approach,*" technical report by the Joint Research Centre (JRC), the European Commission's science and knowledge service, 2017, p.26.

further sign of the complete failure of the economic policies of those years. I will come back to this result in the discussion of the theoretical insights, in Chapter 3.3.

PART II

THEORETICAL INSIGHTS FROM THE ANALYSIS OF IPUMS DATASETS AND FURTHER RESEARCH DIRECTIONS

3. Industrial Concentration in the Twentieth Century: industrialisation waves and reaction to economic shocks

As seen in Part I, throughout the Twentieth Century, the figures for industrial concentration and household income inequality (in parallel with the progressive growth of the GDP per capita) follow, in the long run, similar trends for the US, for Canada, and for the European countries analysed. But when the South American countries and those of the East-Asian group analysed from the available IPUMS datasets are added to the picture, is it then possible to find common paths of development?

A comparative approach can be put in place by taking the US case as a standard[156]. Basically, for the "new-comers" countries in Latin-America and East-Asia, the figures of the beginning of the 1960s-1970s industrialisation wave are compared to those of the US in the time frame 1860-1970. Of course, many factors of paramount importance must be ignored, starting from the different time range analysed: almost 100 years for the US and 40 years for the other two groups. And in addition to that: different geographic endowments, different levels of technology, different costs of transportation, different type of institutions, different impact of globalisation-related dynamics, and so on[157]. Not to mention the impact of the two World Wars and of the 1929 crisis shocks on the variables of interest.

However, two major elements can be considered as the starting point for the comparison:

[156] Cf. Concha Betran, "Regional specialisation and industry location in the long run: Spain in the US mirror (1856–2002)," *Cliometrica* 5, no. 3 (October 2011): 259-290; Karen Helene Midelfart-Knarvik, Henry G. Overman, Stephen J. Redding, and Anthony J. Venables, "The Location of European Industry," report for the European Commission, 2000; Robin Philips, Matteo Calabrese, Robert Keenan, and Bas van Leeuwen, "The regional occupational structure in Interwar England and Wales", unpublished paper, 2019.

[157] Cf. Sukkoo Kim, "Spatial Inequality and Economic Development: Theories, Facts, and Policies," working paper n. 16, 2008.

a) the similar absolute values of the GDP per capita series in the chosen starting years, namely 1860 per US and 1970 for the other countries. Indonesia, for example, has a very high coefficient of correlation with the US trend for the GDP per capita growth in the time span considered – namely a coefficient of correlation of 0.9, which shows that the two trends proceed essentially in parallel, when the two trends are both divided in four parts: 25 years from each part of the American trend are compared to 1 decade of the Indonesia trend (see the values reported in tab.7 in the Appendix).

b) the fact that the countries analysed are all involved during the considered time frames in a huge process of reallocation of the population from the countryside to the urban areas, due to the industrialisation boost – despite, such as in the case of Argentina in the early 1980s, short run inversions of the trend were still possible. As described in the previous chapter, this movement is reflected in the reduction of the percentage of people employed in the primary sector in the datasets analysed.

The focus of this comparison hence, by following Milanovic's theoretical framework, is on the time period that goes from the surge of the respective Kuznets' waves to their release (after reaching the peak in the level of household inequality level).

3.1 An "old" industrial revolution: East-Asia and South America in comparison with the US

As seen in Chapter 2, the process of industrialisation did not proceed uniformly among the six countries considered for the East Asian and the South American groups. Whereas for Indonesia and Malaysia can be easily hypothesised a specialisation peak in the 1970s, for Thailand and China the placement of the peak has a greater degree of uncertainty, due to the scarce availability of data. In the same way, for Brazil and Argentina, the presence of peculiar issues related to national political vicissitudes and again a lack of data for the most recent decades, leave the individuation of the peak to the rank of hypothesis. However, for all these

countries, the figures of industrial concentration eventually assume (more or less rapidly) the form of “displaced” Kuznets’ curves. Or in Milanovic’s terms, of “Kuznets’ waves”.

3.1.1. East-Asian miracles

As I report in the Appendix, the Krugman Index and the household income inequality series follow essentially the same pattern for Indonesia and Malaysia – their coefficient of correlation is 0.87 (see Appendix, tab. 6). Due to the high correlation between the US and the Indonesia values of the Krugamn Index as well as for the GDP series (see Graph 4-5 in the Appendix), and since Indonesia has in IPUMS the biggest datasets in absolute numbers - therefore with a lower risk of potential errors in the stratification of its datasets - I will use then, in the comparison with the US trends, the Indonesia figures as a reference.

Differences in geographical endowments, transportation costs, level of technology, globalisation influence (and all the other residual factors above mentioned) determine the differences in the absolute values for the Krugman Index.

The absolute values for the GINI coefficients are always smaller for Indonesia. This is in line with the results of the World Bank Report of 1993, being the low levels of income inequality the main feature of the “East-Asian miracle” during these years. The year 1970 and the Interwar years in the comparison with the US trend, are the peaks for the two countries in the level of industrial concentration and household income inequality, although with different absolute values. In the next time slots, the income inequality decreases for both countries, concurrently with the growth of the GDP per capita, as predicted by Kuznets. The industrialisation dynamics in the East-Asian countries, though, run at a much greater speed, as it is visible in their GDP per capita growth rates, reported in the Appendix. The upturn in the inequality level for Indonesia in the 2000s, in this perspective, can be considered as a sort of counterpart of the upturn in the inequality level, as assessed for the Western countries in the 1970s.

I argue, hence, *that the peak of a Kuznets wave was reached in Indonesia and Malaysia in the 1970s. Afterwards, both the Krugman Index and the Gini values decreased. The absolute values for those countries are much smaller than those of the historical series for the US. This*

is due to the differences in geographical endowments, transportation costs, level of technology, globalisation influence, and other residual factors. In the 2000s, there was then an upturn in the inequality figures and, consistently, in the Krugman Index values, for the Asian countries. This is the main divergence with the US trend. Unfortunately, the absence of data in IPUMS for the years after the 2000s makes harder the interpretation of this value. In paragraph 3.3 and 4.1, nevertheless, I hypothesise that this inversion in the trend can be put in relation with the shock effects of the 1997 financial crisis in the area.

3.1.2. Thailand, China, and South American countries

For Thailand, the trend of industrial concentration had a potential peak in the 1990s and then it decreased until the 2000s (last year available on IPUMS). The trend for income inequality, followed the same pattern, with a curve having a peak in the 1990s and then been descending. For China, instead, both trends were in the 2000s still on the rise. Without further data on the 2010 and 2020 decades, *it is therefore only possible to hypothesise a peak for Thailand during the 1990s and a peak for China either in the 2000s or in the 2010s. For the China case, it is indeed easily predictable, for the two decades after the 2000s, a regime of increasing reductions of transportation costs, increased congestion costs, and a growing percentage of the population employed in the tertiary. All these factors, as seen above, inevitably lead ceteris paribus to de-specialisation trends at the country level.*

The income inequality trend for Brazil was upwards from the 1970s to the 1990s and then declining from the 2000s. The level of industrial concentration had a peak in the 1970s and then was always declining until the 2010s. The trends of industrial concentration and income inequality were thus in contrast, until the 2000s. For Argentina, the values of the GINI coefficient were instead growing, in medium run, from the 1970s until the 2000s. The industrial concentration trend, on the other hand, was subject to many oscillations: after a first decrease in the 1980s, it was growing in the 1990s and then again declining in the 2000s. The Kuznets' wave hypothesis seems eventually to be not appliable for these cases.

As for the East-Asian countries, however, many factors, from the level of transportation costs and the type of geographical endowment, are here ignored in order to make the comparison

with the historical series of the other countries possible. One of those factors is the quality of the institutions. A key feature, according to the World Bank Report of 1993, for the success in terms of developmental growth and low levels of inequality for the East-Asian countries in the 1970s-2000s. It is therefore interesting to note, with Buoirguignon et al., that "although the secular decline in inequality, which began in 1993, is associated with declining inflation, it also appears to have been driven by four structural and policy changes, namely, declining returns to education; pronounced rural-urban convergence; increases in social assistance transfers targeted to the poor; and a possible decline in racial inequality. Falling inequality has made a substantial contribution to poverty reduction"[158].

In line with this idea, *it is then possible to prospect also for the Brasilian case a displacement in time of the Kuznets wave. The income inequality series is, moreover, fully compatible with a displaced Kuznets' wave* – in line with the thesis of Milanovic, affirming that "the overall shape of changes in inequality in Brazil over the past 150 years, including the most recent period, is fully compatible with the first Kuznets wave"[159]. Nevertheless, the absence of data on industrial concentration after the 2000s in the IPUMS datasets once again hinders a consistent testing of this theory.

A similar interpretative approach can be used as well for the Argentinian case. The quality of institutions seems to be also here a key element for the evaluation of the distortions in the two trends. Nevertheless, the occurrence of its economic and financial crisis between 1998 and 2001 introduces a further factor of destabilisation in the two trends. In particular, the smaller value for industrial concentration in the 2000s can be, at least partially, related to the dynamics of the crisis and could be not reflecting the beginning of a decreasing trend. I will investigate more in detail the Argentinian figures for industrial concentration in the 2000s in chapter 3.3, in relationship to the analysis of the effects of economic and financial shocks on the level of industrial concentration.

[158] François Bourguignon, Francisco Ferreira, and Marta Menéndez, "Inequality of Opportunity In Brazil," *Review of Income and Wealth* 53, no. 4 (December 2007): 585-618, p. 585.

[159] Branko Milanovic, *Global inequality: a new approach for the age of globalization* (Cambridge, Massachusetts: Harvard University Press, 2016), p. 82.

3.2 The 1970s as a benchmark decade in the Western world: the beginning of a new phase?

For the group of Western countries analysed, the figures for industrial concentration have a decreasing trend in the long run (despite temporary upturns for Canada, France, and Germany), from the 1940s until the 2010s. On the contrary, the values for the household inequality level are on the rise from the 1970s, in all the contexts analysed. I argued in the previous paragraphs that the concurrent increase in the 1970s in the industrial concentration and income inequality values for the East-Asian and Latin-American countries, can be attributed to a process of industrialisation that under many respects resembles the one starting in the 1860s in the US. The trends analysed have the characteristics of "displaced" Kuznets' waves.

The divergence that I measured for the two trends in the Western context, instead, is in contrast with Milanovic's hypothesis about the rise of a second Kuznets' wave starting in these years, and with the findings of Midelfart-Knarvik et al.[160] for Europe as a whole. The industrial concentration series for the group of Western countries are all unambiguously decreasing after the 1970. The inversion of the trend for Canada in the 1980s, and France and Germany in the 1990s, is just temporary.

As demonstrated for all the patterns analysed in Part I, the rising inequality in the early stages of the industrialisation process is always consistently linked to periphery-to-core migrations of population. Namely, from the countryside to clustered industrial centres (as predicted in Kuznets' original hypothesis and confirmed in Milanovic's theoretical framework). I argue hence, for the time frame here considered (1970-2000), the following: *despite periphery-to-core movements were still existing between 1970 and 2010 within the Western countries analysed, these movements were not broad enough to alter or distort the decreasing trend of the industrial concentration series. The findings of the present research, thus, cannot support Milanovic's thesis about the outbreak of a second Kuznets' wave in the Western world during*

[160] Cf. Karen Helene Midelfart-Knarvik, Henry G. Overman, Stephen J. Redding, and Anthony J. Venables, "The Location of European Industry," report for the European Commission, 2000.

the 1970s. At least not with the same characteristics of the first, since one of the main conditions for the insurgence of the curve is missing.

3.3. Effects of economic shocks on the level of industrial concentration

A further aspect emerges from the analysis of the IPUMS data. Namely, a certain similarity that can be found for the industrial concentration figures concurrently with (or better, after) the main economic shocks of the Twentieth Century: the two World Wars, and the financial crises of 1929, 1973, 1997. The years after 1929, for example, are years of increasing industrial concentration – see the series for the US, the UK, and Spain in the Appendix (tab. 2). In the same way, after the financial crisis of 1997, there are increasing values of industrial concentration for the East-Asian countries analysed – with the sole exception of Thailand, which however in that decade, despite the decline, had levels of industrial concentration higher than the average, compared to the other East-Asian countries. By referring to Krugman's model, I argue *that these upwards and temporary oscillations in the decreasing trends for industrial concentration are the potential outcome of homeostatic reactions of the overall industrial apparel to conjunctural economic and financial crises. Consequent rising transportation costs and reductions in the general demand are tackled at the state and firm-level with the promotion of scale economies and comparative advantage policies.*

As seen throughout the analysis, the most typical sign of this reaction is the growth of the concentration levels in those sectors that benefit the most from the adoption of economies of scale. In particular, those related to export (Wholesale and retail), but also the manufactures for internal demand in general.

This picture is coherent with the effects produced by the above-mentioned crises on the industrial tissue of the countries object of the present research. This is what happened for example after the financial crises of 1929 and most likely also for the 1997 crisis in Asia – and for the 2008 financial crisis in Europe and in the US (see paragraph 4.1). Ultimately: small upwards distortions in an otherwise always decreasing trend.

How to explain then on the one hand, the quick reduction in the levels of industrial concentration after the Second World War, and on the other, the decreasing value of the Krugman Index for Argentina after the economic crisis in the second half of the 1990s?

I argue here *that disrupting shocks highly affecting the industrial apparels, such as wars and structural economic upheavals, make it difficult for firms and governments a re-organisation based on industrial convergence. The actual destructions of the former, and the aggregated chains of failures through the sectors of the latter, strike at the very heart of the productive tissue. The outcome, by following again Krugman's theoretical framework, is that the periphery becomes more similar to the core. Countries become more de-specialised but with a decreasing GDP per capita. In this case, lower levels of industrial specialisation should be considered as the indicator of a weakened economy*.

The case of Argentina is indicative in this respect. The Argentinian "Industrial Specialisation Regime" (see paragraph 2.4.2 in Part I) was one of the main factors – alongside with the effects of the previous privatization policies, the loss of competitivity of the Argentinian industrial apparel, and the failure of the convertibility system (1 peso = 1 dollar)[161] – on the basis of the structural crisis, financial and economic, which ravaged Argentina between 1997 and 2001. The final outcome of the policies aimed at enhancing the clustering of the export sector during the 1980s and the 1990s was a general weakening of the overall Argentinian economic structures and, eventually, a generalised economic crisis. State investments for the big groups involved in the export trade dragged conspicuous resources from the other industrial sectors – with a consequent decline of these sectors in terms of globalised competition – and from the formation of the human capital endowment. Furthermore, the export incentive policies proved themselves to be an inefficient strategy: in the 2000s, also those firms involved in the export trade were subject to the chain of failures affecting the whole Argentinian industrial system – as it is visible, for example from the decreasing percentage of people employed in the "Wholesale" sector in the census survey of the 2000s compared to that of the 1990s. All these factors together revealed that the pursuing of

[161] Cf. Sebastián P. Salvia, "The boom and crisis of the Convertibility Plan in Argentina," *Revista de Economia Política* 35. (2015): 325-342.

industrial convergence policies at the state and firm level were an inefficient industrial strategy in the presence of this set of conditions.

The theory about a relationship between small economic shocks and increasing values of concentration, and disruptive shocks and decreasing values of concentration should be, nevertheless, supported by further research on the occupational series for the countries subject to the present research. As seen for the UK series, for example, the Krugman value which I have found with Philips et al.[162] for 1939, if confirmed, could potentially[163] invalidate my thesis. As described for the UK in Chapter 2, indeed, this value depicts a decline of almost 50% of the concentration trend already before the outbreak of World War II. With the exception of the US, the exact value for the 1930s or, coherently, for the beginning of the 1940s is not available for all the countries analysed – the value is known for Spain, but in that series the values for the 1920s and for 1940s are missing.

In the same way, the mechanisms that made less decisive the reaction of firms and government to the oil crisis in 1973 (at least, in such a way to affect the trends for industrial concentration) are not clear. Moreover, as said for Canada, disentangling a potential effect of this crisis from the effect of the introduction of Washington consensus liberalisation policies in the same years is not easy, since the sectors potentially involved in clustering reactions – in particular Wholesale and retails, and Transportation and Communications – are the same.

[162] Cf. Robin Philips, Matteo Calabrese, Robert Keenan, and Bas van Leeuwen, "The regional occupational structure in Interwar England and Wales," unpublished paper, 2019.

[163] Since another interpretation could relate this number to the crisis of 1929.

4. Industrial Concentration in the Twentieth-First Century: where do we go from here?

Periphery-to-core migrations of the population, as seen above, do not play a determinant role in shaping the figures for household income inequality in the Western world during the time period 1970-2010. At least, not in the same way as for the previous Kuznets' wave of the period 1860-1970 or for the emerging East-Asian or South American curves of the period 1970-2000. As seen in the previous chapter, despite the upward movement of the income inequality trend is not consistent with the original Kuznets' hypothesis – namely, that in this phase inequality should be on the same descending trend as industrial concentration – it is not consistent also with Milanovic's hypothesis about the insurgence of a new Kuznets' wave. My results deny the similarity of the underlying conditions between the two periods (1860-1970 and 1970-nowadays).

How to interpret then the results on the increase from the 1970s of the income (and wealth) inequality divide?

And how to include in the picture, once the safer boundaries of the Kuznets' wave hypothesis are removed, the parallel declining figures for industrial concentration?

The widening of the inequalities within countries from the 1970s until nowadays is a fact[164]. Milanovic ascribes it to a series factors, from the global structure of demand to the predominant role played by the service sector: "the increase in inequality happened in part because the new technologies strongly rewarded more highly skilled labor; drove up the share

[164] See the series reported for example in Thomas Piketty, *Capital in the twenty-first century* (Belknap Press of Harvard University Press, 2014); Branko Milanovic, *Global inequality: a new approach for the age of globalization* (Cambridge, Massachusetts: Harvard University Press, 2016).

of, and the return to, capital; and increasingly opened the economies of rich countries to competition from China and India. The structure of demand, and thus of jobs, moved toward services, which in turn were staffed by less qualified and worse-paid labor. On the other hand, some service sector jobs, as in finance, were extremely highly paid. This widened wage, and ultimately income, distribution" [165].

All these factors together are prospected in the first place, to lead towards a process of reduction of the inequality level *between* countries. Notably, between the Western world and the rapidly growing Asian and South American economies, as well as the African ones[166]. On the other hand, due to the increasing *within* nations' inequalities, they are also likely to lead towards class polarization and therefore social instability or political reorganization of the low-income classes[167]. Consequently, they are one of the catalysts for the emergence of those endogenous shocks, of the type of wars and revolutions[168], able to modify the structure of the series for both income inequality and industrial concentration on the basis of the Kuznets' waves. In the same way as it happened with the two world wars between 1914-1945.

4.1. Inversions of the industrial concentration trends catalysed by financial crises: the 2008 case

In this respect, my analysis has revealed the possibility that also economic and financial shocks can determine divergencies in the trends of income inequality and industrial concentration in the short and medium run. For the Twenty-First Century, I discussed above the case of the financial crisis of 1997 in the East-Asian countries and their possible reaction in the 2000s through the recourse to industrial concentration policies. The values for the decades after 2000 are not available for these countries in the IPUMS datasets. Therefore, it

[165] Branko Milanovic, *Global inequality: a new approach for the age of globalization* (Cambridge, Massachusetts: Harvard University Press, 2016), p. 55

[166] *Ibid.*

[167] Cf. Thomas Piketty, *Capital et idéologie* (Le Seuil, Kindle Edition, 2019).

[168] The malign forces theorized by Milanovic in Branko Milanovic, *Global inequality: a new approach for the age of globalization* (Cambridge, Massachusetts: Harvard University Press, 2016).

is not possible to establish whether these values are a temporary distortion of the decreasing trend of the Kuznets' wave begun in the 1970s. Or the beginning of a new phase of industrialisation, namely, the beginning of a new Kuznets' wave – but in this case, with the same features of the previous one.

The case of the growing value of 2015 – the only one available, among the countries analysed, after 2011 – of industrial concentration in the US can be interpreted with the same approach. The Krugman Index value for the US in 2015 can reveal a reaction of the US firms to the 2008 crisis throughout the 2010 decade. As mentioned above, the values found for 2011 for the other Western countries are potentially in contrast: they are all declining compared to the 2000s (except for France, which has an upturn as well).

The US' Krugman value for 2015, however, can have some relationship with the income inequality dynamics which have started in the 1970s. It is indeed the first time, since the 1930s, that the value for industrial concentration had an increasing upturn in the US. Nevertheless, until the value of the 2020s will be made available for the countries of interest of the present research, it is not possible to evaluate this trend on the medium run.

4.2. Future scenarios for industrial concentration: endogenous and exogenous shocks

While I am writing these lines, humanity is experiencing another type of economic shock, that can be considered as exogenous[169]: the Covid-19 pandemic. This shock, potentially, can affect the values for industrial concentration and income inequality for the 2020 decade. And therefore, introducing a further variable in the analysis of the industrialisation dynamics between the end of the Twentieth Century and the beginning of the Twenty-First.

[169] Despite elements of endogeneity can be found also in the emergence of pandemic shocks. For example, as an outcome of increasing deforestation or of climate change. Cf. Branko Milanovic, *Global inequality: a new approach for the age of globalization* (Cambridge, Massachusetts: Harvard University Press, 2016), p.69.

How will the trend for industrial concentration be affected by this shock?

By referring to the theory I have introduced in Chapter 3 on the effect that economic shocks have on the industrial concentration level, it is easily predictable that much will depend on the length of the pandemic. Not being the economic structures dismantled as during the two world wars, and, moreover, having the transportation costs become greater (due to the nature of the pandemic and to the limitations to traveling), firms and government are likely to promote clustering policies. Thus, resulting in an increase of the level of industrial concentration. On the other hand, though, in case the length of the pandemic and of the measures adopted for its limitation should be longer than just months, it is possible that the continuative reduction of the circular demand (and of the demand in general) will have a counter effect. It will result indeed in a loss of efficiency of those clustering policies. And, therefore, in a reduction of the industrial concentration level. Finally, in either case, a further variable to be considered is the level of technology/productivity. The pandemic seems to have triggered, for example, broader employment of remote working customs within the service sector. It goes without saying that a persistence of this approach will enhance a tendency towards de-specialisation dynamics. One of the challenges for the economic historians interested in analysing the industrial concentration trends, and their relationship with the income inequality level for the beginning of the Twenty-First Century, will be hence disentangling the effect of this shock from the other underlying forces determining the industrialisation dynamics.

4.3. Future research directions: industrial concentration and income inequality for African economies

Another path of research that must be faced by the economic historians in the next years is the study of the economic development of the countries of Africa, from the Mediterranean area to the SSA countries. Notably, in terms of the analysis of the integrated patterns for industrial concentration, economic growth, and income inequality.

As argued by Fosu, despite "a pervasive view that the situation as regards poverty in SSA has not changed much since the 1980s" [170], it has been demonstrated that thanks to an increasing process of industrialisation of these countries, "while the headcount poverty incidence rate at the $1.25 level increased by about 6.6 percentage points between 1981 and 1996, it actually fell by 6.0 percentage points during 1996–2005, and further by 3.6 percentage points between 2005 and 2010. However, at 9.2 percentage points and 8.4 percentage points, the rates of poverty decline during 1996–2005 and 2005–2010 were, respectively, faster for SAS, a region of the world that has also experienced historically high levels of poverty" [171]. Essentially, many of the countries of this area (in particular, Cameroun, Ethiopia, Nigeria, Swaziland, Ghana, Uganda, Senegal, and Mali[172]) have potentially entered, beginning from the 1990s or the 2000s, the ascending phase of a Kuznets' wave of industrialization. The analysis of the figures for income inequality and level of industrial concentration can reveal in the first place, whether also for this context is possible to individuate displaced Kuznets' waves. Secondly, it would assess the effect of the variable 'Productivity' – hence, the level of technology – on this wave of industrialization. The curves analysed in the present research for Europe, the US, Canada, the group of East-Asian countries, and the South American countries, had all in common that at the beginning of their industrialization process the movements from the agrarian periphery to the industrialised core were based on the location of manufactures and on the location of markets. Furthermore, comparative advantage dynamics were at stake alongside the whole period analysed, from the end of the Nineteenth Century to the end of the Twentieth.

Will industrialisation in the SSA context in the Twenty-First Century benefit instead, from a de-specialised approach already in its early phases?

The increased role of the service sector for all the countries analysed above, the generalised reduction of transportation costs, the increased accessibility to the know-how, are all factors that can determine a reduced need for the pursuing of clustering strategies. Investing in comparative advantage strategies at the firm and at the state level could represent an

[170] Augustin K. Fosu, "Growth, Inequality and Poverty in Sub-Saharan Africa: Recent Progress in a Global Context," *Oxford Development Studies* 43, no.1 (2015): 44-59, p. 45.
[171] *Ibid.*
[172] *Ibid.*

inefficient strategy in a world which is increasingly de-specialised. Diversification of industrial activities could be, instead, the most efficient approach on the basis of the industrialisation waves of the Twenty-First Century for the SSA economies. A strong cooperation between firms and governments will be nevertheless necessary, so to align and combine state investments and policies to entrepreneurial innovations.

5. Conclusions

The analysis of the trends for industrial concentration, GDP growth per capita, and income inequality – based on data from IPUMS International, Maddison Project, Clio-Infra, and World Bank Open Data – in the context of the US, Canada and other selected countries from Europe, South America, and East Asia, has led to the following results:

a) after a comparison between the Krugman Index values and the GINI coefficients for the historical series of US, UK, and Spain, I argue in the first place, that the 1970-2000 series for the group of East-Asian countries subject to the research is coherent with the presence of "displaced" Kuznets' waves – where the latter is a theoretical tool (introduced by Milanovic) that revises the original Kuznets' hypothesis by shifting the focus from the long-run to more limited period of times.

Secondly, for the group of South American countries analysed, I confirm the results of Deinenger and Squire on the unidirectionality of the trends for economic growth and income inequality between the 1960s and the 2000s. Namely, that both trends are raising, instead of diverging at a certain point, as it would have been expected, according to the original Kuznets' hypothesis. Nevertheless, the inversion of the income inequality levels for Brazil, and the extreme oscillatory nature of the trends for Argentina, seem to prospect a potential displacement of a Kuznets's wave for the two countries in a subsequent period. Limitations in the available datasets for the years after 2000s hindered, though, a consistent verification of this hypothesis.

b) I argue on the one hand, that, for the Western countries analysed, the series for industrial concentration and income inequality between 1860 and 1970 are fully compatible with a Kuznets' wave. On the other, that the series after the 1970s are instead in contrast with Milanovic's thesis of a second Kuznets' wave starting during these years. Nevertheless, the value for industrial concentration that I found for the US in 2015 can have some relationship with the rising income inequality levels analysed by Milanovic. Further research should be

devoted to the analysis of this issue when the census datasets for the 2020s decade will be made available.

c) I argue that a further theoretical insight, derived from my analysis, can be considered as a corollary of Krugman's theory on industrial specialisation dynamics. Namely, that being equal the transportation costs and the level of technology/productivity, lighter economic shocks trigger increasing levels of industrial concentration, whereas highly disruptive shocks for the industrial tissue, such as wars and structural economic crises, produce instead decreasing levels of industrial concentration. Further research is necessary, though, in order to corroborate this theory.

5.1. Societal Relevance

Ultimately, the present thesis provides in the first place, a different perspective for the analysis of industrialisation dynamics. The focus on the trends of industrial concentration sheds further light on the role that the processes of regional specialisation or, alternatively, de-specialisation, play in the determination of the social inequalities within countries.

Secondly, it aims at providing valuable insights for future policy interventions. I refer here in particular, to my analysis of conjunctural and structural shocks and their effect on spatial decisions of countries and firms. Policymakers should be able to predict the variations in the level of efficiency for clustering policies and to configure, accordingly, related policies. In the case of structural shocks, for example, policymakers should prospect the probable consequent de-specialisation of the country industrial tissue, in a regime of low economic growth rates[173] - *ceteris paribus* the level of transportations costs and the level of productivity. This condition will produce variations, for example, in the structure of the industrial districts in the cities or on the component structure of rural-urban migration flows. A conjunctural shock, instead, will likely produce clustering phenomena with an increased recourse to scale economies strategies by the firms. At the government-level as well, when the shock is not

[173] Unless continuative limitations to mobility will keep high the transportation costs and the cumulative effect will then be ambiguous

structural, the pursuing of economies of scale strategies can likely represent an efficient homeostatic reaction of the productive apparel to this type of crises.

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Appendix

Tab. 2. Krugman specialization index, country averages per year (In blue my results from IPUMS, 2020)

Nation/Year	1860	1880	1890	1900	1910	1920	1930	1940	1950
United States (Kim)	0.69	0.59	0.59	0.75	0.89	0.86	0.87	0.81	0.66
Spain (Tirado et al; Betran)	0.44		0.61	0.79			0.96		0.66
Italy (Missaia; Daniele et al.)	0.93/ 0.58		0.93		0.7				0.9
Uk (Crafts and Mulatu; Philips et al., Martin et al.)	0.66	0.64	0.64	0.59	0.61	0.79	0.72	0.49	
`France (Dormard)									
Germany (Suedekum)									
Belgium	0.42		0.52				0.56		
Netherlands	0.36		0.42				0.49		

Nation/Year	1960	1970	1980	1990	2000	2010	2015
United States (Kim)	0.57	0.5	0.43	0.38	0.34	0.32	0.34
Spain (Tirado et al; Betran)	0.72	0.68	0.64	0.6	0.5	0.44	
Italy (Missaia; Daniele et al.)	0.9	0.88	0.86		0.79/ 0.75	0.71	
Uk (Crafts and Mulatu; Philips et al., Martin et al.)		0.3/ 0.38	0.28/ 0.34	0.29	0.28	0.26	0.26
`France (Dormard)	0.25	0.21/ 0.23	0.19	0.2	0.16	0.18	
Germany (Suedekum)		0.19	0.16	0.2	0.17		
Belgium		0.42				0.33	
Netherlands		0.3				0.22	

Tab. 3. Regional structure of European manufacturing. Krugman Index calculated on the country specialization structure against the average for the whole Europe[174](14 states). Source: Midelfart-Knarvik et al., 2000:472.

	1970/1973	1982/1985	1988/1991	1994/1997
Spain	0.44	0.28	0.33	0.33
France	0.204	0.188	0.207	0.201
UK	0.231	0.190	0.221	0.206
Germany	0.319	0.309	0.354	0.370
Italy	0.351	0.353	0.357	0.442
Weighted average (whole Europe)	0.326	0.302	0.33	0.351
U.S. average (Kim's results, 1995)	0.57	0.50	0.43*	/

*This level is obtained in fact for the year 1987

[174] Therefore, not region against single country, as it is applied throughout the present paper.

Tab. 4. Krugman specialization index, country averages per year, Canada. My calculations from IPUMS, 2020

	1971	1981	1991	2001	2011
Canada	*0.19*	*0.21*	*0.18*	*0.18*	*0.14*

Tab. 5. Krugman specialization index, country averages per year, Brazil and Argentina. My calculations from IPUMS, 2020)

	1960	1970	1980	1990	2000	2010
Brazil	*0.35*	*0.38*	*0.36*	*0.31*	*0.26*	*0.23*
Argentina		*0.44*	*0.32*	*0.48*	*0.27*	

Tab. 6. Krugman specialization index, country averages per year. Indonesia, Malaysia Thailand, and China. My calculations from IPUMS, 2020

	1970	1980	1990	2000
Indonesia	*0.35*	*0.24*	*0.24*	*0.26*
Malaysia	*0.24*	*0.21*	*0.21*	*0.23*
Thailand	*0.32*	*0.39*	*0.40*	*0.36*
China		*0.25*	*0.31*	*0.32*

Tab. 7. Real GDP per capita (in 2018 dollars). Absolute values for selected countries and years*. Source: Maddison Project Database, 2020

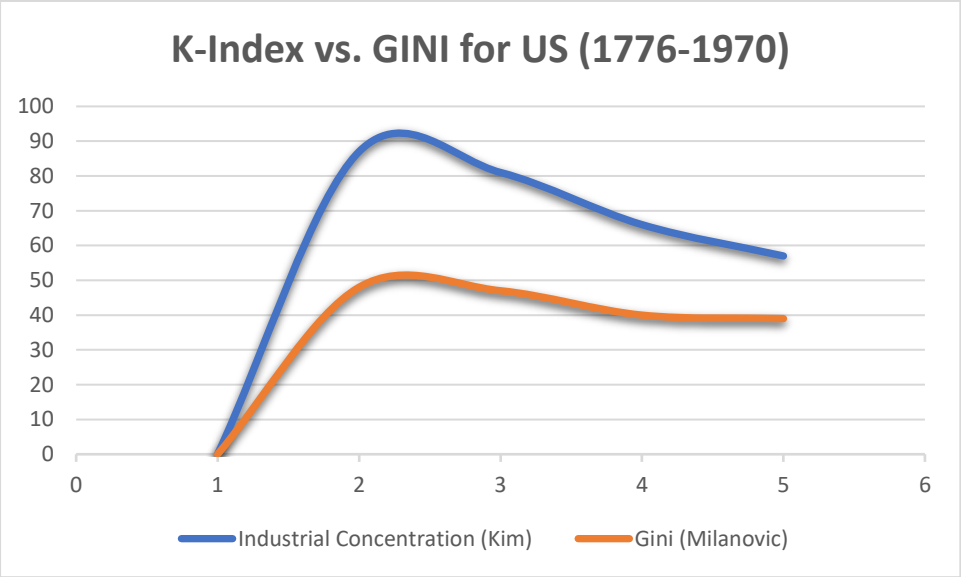
Nation/Period	1	2	3	4	5
Malaysia	3862	6792	9529	14598	18710
Indonesia	2074	3283	4414	5664	8425
Brazil	4404	6005	10687	10161	11263
US	3425	4866	6252	7586	10543

* Years: 1860, 1880, 1890, 1910, 1929 for US; 1970-2010 for the other countries.

Tab. 8. K-Index for US (Kim, 1995) and Indonesia (calculations of the author, 2020) and Gini for US (Milanovic, 2013) and Indonesia (Source: World Bank Open Data, 2020) in selected comparison years and normalised to 100.

	Period:	1	2	3	4
Krugman US		87	81	66	57
Krugman Indonesia		35	34	32	36
Gini US		48	47	40	39
Gini Indonesia		35	24	24	26

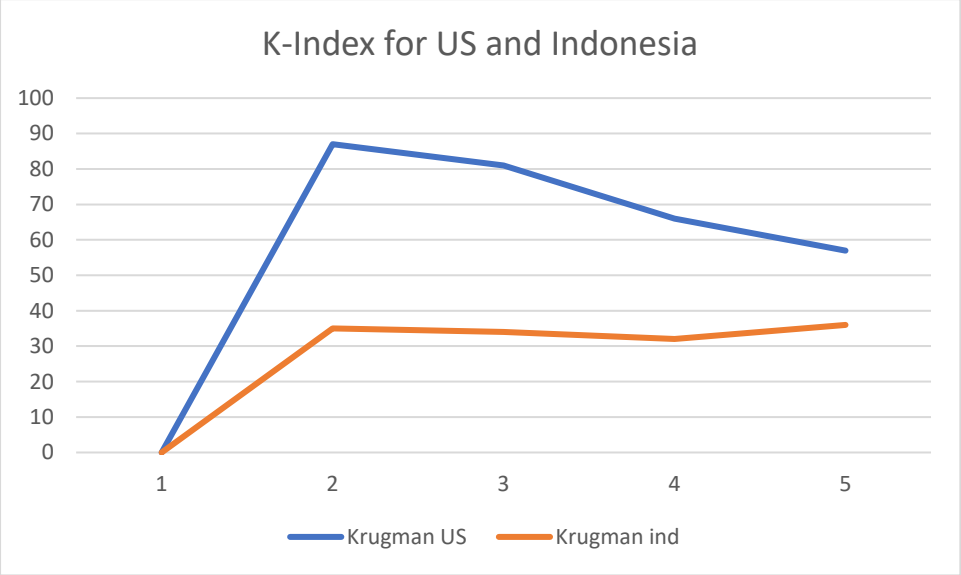
Graph. 3. Krugman Index vs. GINI coefficient for US (1776-1970)*.



Source: my calculations from IPUMS (2020), from Milanovic (2013), and from Kim (1995).

*The values for both variables are normalised on a 100 scale. The time axis is divided in sections, where the section 1-2 corresponds to 1776-1860 and section 3-5 to the period 1930-1970

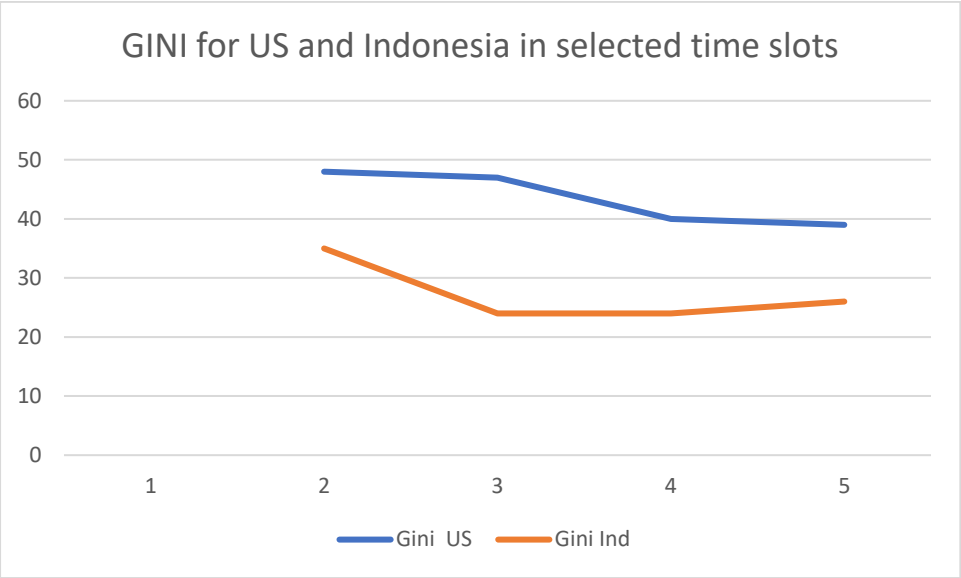
Graph. 4. Krugman Index for US and Indonesia in selected comparison years*.



Source: my calculations from IPUMS (2020) and Kim (1995)

*The time range of interest in the graph above is between period 1 to period 5. The time slots indicated in the X axis represent the range 1860 to 1970 for the US, where the slot 2 corresponds to the year 1860, the slot 2 to the year 1930, the slot 4 to the 1950 and the slot 5 to the 1970. For the East-Asian countries the range is 1970-2000. Slot 2 is the year 1970, slot 3 is the year 1980, and so on, until slot 5 that is the year 2000.

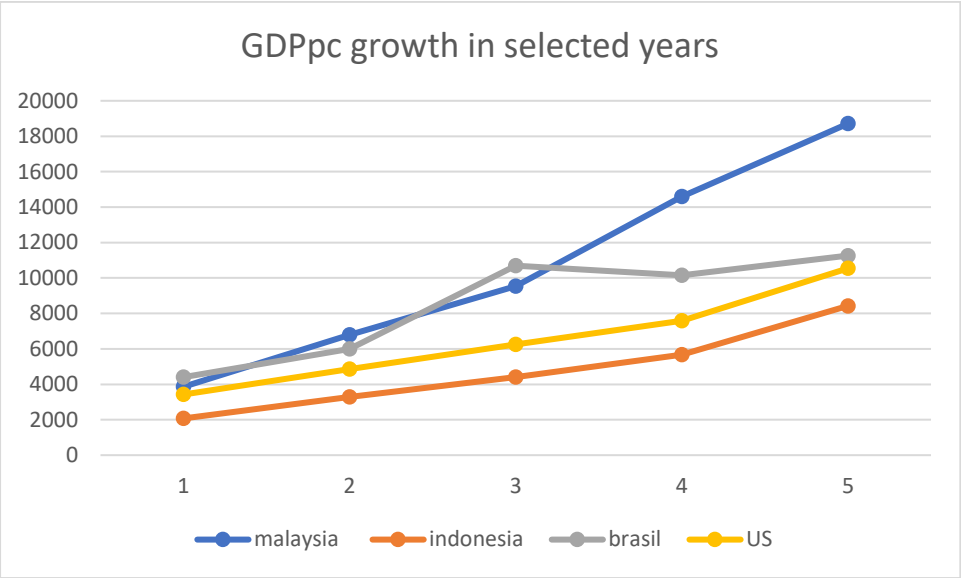
Graph. 5. GINI coefficients of Indonesia and US per selected time periods*.



Source: World Bank Open Data, 2020 and Milanovic (2013)

*The time range of interest in the graph above is between period 1 to period 5. The time slots indicated in the X axis represent the range 1860 to 1970 for the US, where the slot 2 corresponds to the year 1860, the slot 2 to the year 1930, the slot 4 to the 1950 and the slot 5 to the 1970. For the East-Asian countries the range is 1970-2000. Slot 2 is the year 1970, slot 3 is the year 1980, and so on, until slot 5 that is the year 2000.

Graph. 6. Real GDP per capita growth in US, Brazil, Indonesia, Malaysia, in selected years.



Source: Maddison Project Database, 2020

Example of my calculation approach: Italy 2011 (census data from IPUMS)

Industry, general recode	Freq.	Percent	Cum.	Percent
Agriculture, fishing, and forestry	73,629	5.91%	5.91	5.91%
Mining and extraction	7,042	0.57%	6.48	0.57%
Manufacturing	204,332	16.41%	22.89	16.41%
Electricity, gas, water and waste manag	23,212	1.86%	24.75	1.86%
Construction	109,900	8.83%	33.58	8.83%
Wholesale and retail trade	141,872	11.39%	44.97	11.39%
Hotels and restaurants	99,692	8.01%	52.98	8.01%
Transportation, storage, and communica	84,728	6.80%	59.79	6.80%
Financial services and insurance	37,140	2.98%	62.77	2.98%
Public administration and defense	96,895	7.78%	70.55	7.78%
Business services and real estate	112,180	9.01%	79.56	9.01%
Education	66,107	5.31%	84.87	5.31%
Health and social work	92,513	7.43%	92.3	7.43%
Other services	70,918	5.70%	97.99	5.70%
Private household services	24,978	2.01%	100	2.01%
		100.00%		
Total	1,245,138	100		
Average Krugman Spec Index	**0.714892**			

Region (code)	Agricult	Mining	Manufact	Electric	Construc	Wholesal	Hotels	Transpor
	5.91%	0.57%	16.41%	1.86%	8.83%	11.39%	8.01%	6.80%
380001	4,444	512	20,800	1,804	8,259	11,617	6,774	6,927
380003	5,440	1,299	51,063	3,816	18,446	25,091	15,135	16,492
380004	1,921	152	2,444	473	2,699	2,817	2,819	1,381
380005	4,718	538	27,912	1,782	9,577	12,754	9,183	6,654
380006	911	107	5,767	416	2,146	3,110	2,166	1,619
380007	1,088	169	3,235	728	2,930	3,924	3,697	2,729
380008	8,292	516	32,131	2,135	10,667	15,760	10,825	7,970
380009	3,529	576	15,478	1,474	6,647	10,006	7,661	4,881
380010	961	127	3,394	370	1,849	2,392	1,591	1,090
380012	3,791	526	8,420	2,339	9,471	13,039	9,563	11,887
380013	1,475	230	4,621	521	2,776	3,125	2,367	1,611
380014	524	25	838	135	724	682	460	351
380015	7,397	348	9,998	2,037	9,609	10,508	7,745	6,697
380016	9,444	563	8,138	1,600	6,814	8,098	5,776	4,193
380017	1,341	116	1,374	278	1,225	1,176	856	614
380018	6,216	131	1,682	652	3,676	3,789	2,437	2,395
380019	9,469	699	4,856	1,762	8,655	9,641	6,953	5,070
380020	2,668	408	2,181	890	3,730	4,343	3,684	2,167
Control	73,629	7,042	204,332	23,212	109,900	141,872	99,692	84,728
Total	73,629	7,042	204,332	23,212	109,900	141,872	99,692	84,728

Finance	Public	Busines	Education	Health	Other ser	Privat	Total	Control
2.98%	7.78%	9.01%	5.31%	7.43%	5.70%	2.01%		
3,279	5,692	9,577	4,594	7,845	5,393	2,170	99,687	99,687
8,973	9,282	24,302	10,202	16,555	12,761	5,019	223,876	223,876
732	2,027	1,659	1,750	2,497	1,192	281	24,844	24,844
3,226	5,334	9,566	5,052	8,030	6,227	1,746	112,299	112,299
936	2,347	2,330	1,471	2,318	1,416	417	27,477	27,477
970	2,733	3,427	1,513	3,001	1,946	1,025	33,115	33,115
3,966	7,191	11,395	6,038	9,874	8,229	2,562	137,551	137,551
2,575	5,335	7,770	3,659	5,993	5,245	1,895	82,724	82,724
469	1,456	1,583	984	1,367	1,238	553	19,424	19,424
4,210	14,270	13,157	5,944	8,670	8,506	3,860	117,653	117,653
687	2,445	2,169	1,476	1,976	1,547	333	27,359	27,359
103	665	416	392	505	325	64	6,209	6,209
2,044	10,171	7,719	7,056	6,230	5,081	1,806	94,446	94,446
1,574	7,375	5,378	4,389	5,144	3,957	745	73,188	73,188
228	1,191	783	690	806	531	112	11,321	11,321
668	4,091	2,508	2,489	2,287	1,388	366	34,775	34,775
1,848	11,507	6,108	6,547	6,536	4,187	1,131	84,969	84,969
652	3,783	2,333	1,861	2,879	1,749	893	34,221	34,221
37,140	96,895	112,180	66,107	92,513	70,918	24,978	1,245,138	
37,140	96,895	112,180	66,107	92,513	70,918	24,978	1,245,138	

Absolute Value of Deviation from the Average

Agricult	Mining	Manufactu	Electrici	Construct	Wholesale	Hotels	Transport	Financial
0.00122	0.06705	0.062309	0.05907	0.01311	0.03205	0.01211	0.01370	0.05846
0.01475	0.17880	0.085798	0.14575	0.07958	0.06291	0.07175	0.12659	0.21177
0.03304	0.01592	0.152143	0.00173	0.06370	0.09408	0.0517	0.05174	0.01011
0.00494	0.07074	0.027503	0.05812	0.00112	0.02404	0.0120	0.01048	0.05703
0.04676	0.00953	0.13588	0.00072	0.06873	0.09202	0.0583	0.04893	0.00462
0.04435	0.01834	0.148272	0.01272	0.06163	0.08628	0.0429	0.03583	0.00371
0.05348	0.06761	0.006855	0.07336	0.00879	0.00285	0.0285	0.02601	0.07695
0.01120	0.07613	0.088355	0.04486	0.02778	0.04341	0.0032	0.01043	0.03950
0.04608	0.01237	0.147494	0.00270	0.07143	0.09708	0.0641	0.05518	0.0172
0.00764	0.06903	0.122896	0.08212	0.00208	0.02203	0.0158	0.07224	0.08352
0.0391	0.02700	0.141489	0.00380	0.06300	0.09191	0.0563	0.04903	0.01133
0.05201	0.00210	0.160003	0.01282	0.08167	0.109134	0.0754	0.06390	0.02705
0.04133	0.04376	0.115174	0.06911	0.00082	0.039874	0.0023	0.01099	0.02520
0.06913	0.07429	0.124277	0.05028	0.02626	0.056861	0.0221	0.01855	0.01255
0.04092	0.01081	0.15738	0.00666	0.07711	0.105652	0.0714	0.0608	0.02368
0.02529	0.01294	0.155872	0.00944	0.05481	0.087234	0.0556	0.03978	0.01184
0.06947	0.09360	0.140339	0.057267	0.00951	0.045985	0.0102	0.00820	0.01993
0.02289	0.05228	0.15343	0.0197	0.05432	0.083329	0.0431	0.04247	0.012273

Public	Business services	Education	Health	Other ser	Private h	KSIr
0.019075	0.004723	0.016401	0.010499	0.01909	0.066816	0.455718
0.017976	0.12654	0.101233	0.104648	0.122984	0.180876	1.631991
0.056899	0.075306	0.02662	0.047309	0.040148	0.008811	0.729386
0.022769	0.004821	0.023329	0.012499	0.03085	0.049841	0.41016
0.053597	0.069324	0.03084	0.049243	0.036989	0.003366	0.708919
0.049613	0.059545	0.030205	0.041861	0.029516	0.020976	0.685822
0.003604	0.011483	0.038245	0.032432	0.059079	0.08251	0.571796
0.022759	0.020831	0.002258	0.009519	0.017003	0.055806	0.473088
0.062792	0.075983	0.038207	0.059523	0.039499	0.002079	0.791748
0.069454	0.02719	0.036823	0.019417	0.062985	0.134476	0.827806
0.052585	0.070759	0.030765	0.05294	0.035142	0.006729	0.731922
0.070956	0.086386	0.047162	0.068841	0.052373	0.017498	0.927386
0.027151	0.021285	0.053644	0.006958	0.01469	0.052243	0.524631
0.001705	0.042154	0.0133	0.018696	0.001159	0.009766	0.54113
0.065527	0.083115	0.042654	0.065587	0.049468	0.015576	0.876447
0.035598	0.067738	0.015441	0.049579	0.037384	0.005408	0.663993
0.040939	0.035646	0.045944	0.00365	0.002084	0.025219	0.608119
0.038776	0.069297	0.024941	0.043179	0.032294	0.015691	0.707996
						0.714892

Example 2 of my calculation approach: China 1982 (census data from IPUMS)

Industry, general recode	Freq.	Percent	Cum.	Percent
Agriculture, fishing, and forestry	3,672,560	73.18%	73.18	73.18%
Mining and extraction	82,927	1.65%	74.83	1.65%
Manufacturing	604,071	12.04%	86.86	12.04%
Electricity, gas, water and waste manag	18,184	0.36%	87.23	0.36%
Construction	108,716	2.17%	89.39	2.17%
Wholesale and retail trade	132,827	2.65%	92.04	2.65%
Hotels and restaurants	24,714	0.49%	92.53	0.49%
Transportation, storage, and communica	88,726	1.77%	94.3	1.77%
Financial services and insurance	10,248	0.20%	94.5	0.20%
Public administration and defense	79,044	1.57%	96.08	1.57%
Business services and real estate	5,340	0.11%	96.19	0.11%
Education	121,822	2.43%	98.61	2.43%
Health and social work	39,777	0.79%	99.41	0.79%
Other services	21,657	0.43%	99.84	0.43%
Other industry, n.e.c.	2,823	0.06%	99.89	0.06%
Unknown	5,374	0.11%	100	0.11%
Total	5,018,810	100.00%		
Average KSIr	0.257068			

Percent	73.18%	1.65%	12.04%	0.36%	2.17%	2.65%	0.49%	1.77%
Region	Agriculture, fishing, and forestry	Mining and extraction	Manufacturing	Electricity, gas, water and waste manag	Construction	Wholesale and retail trade	Hotels and restaurants	Transportation, storage, and communica
156011	14,674	706	17,161	407	3,880	3,347	688	2,218
156012	13,160	505	16,973	447	2,212	2,737	477	1,926
156013	203,293	6,080	24,643	705	4,706	5,642	923	3,371
156014	88,879	5,966	13,549	546	2,510	3,138	397	2,157
156015	59,930	2,052	8,844	439	2,625	3,304	522	2,178
156021	77,555	6,723	48,302	1,587	7,891	8,990	1,720	5,584
156022	52,363	3,296	17,664	601	3,027	4,687	933	2,548
156023	68,220	5,297	25,019	1,003	4,990	6,855	1,544	4,104
156031	18,111	76	33,634	730	3,262	4,560	857	3,594
156032	219,910	4,076	65,804	929	10,630	8,624	1,573	6,990
156033	122,699	2,118	47,605	688	6,202	5,821	1,102	3,824
156034	200,600	3,121	19,205	537	4,297	5,346	1,075	3,193
156035	78,629	1,952	14,363	557	3,365	3,540	516	2,664
156036	110,935	3,178	16,247	647	3,610	3,562	629	2,336
156037	305,881	6,174	36,308	915	5,839	7,666	1,431	3,985
156041	319,704	4,892	23,896	906	3,236	7,068	1,166	3,756
156042	188,398	1,992	27,126	756	4,526	6,464	1,069	4,515
156043	216,542	4,009	23,980	715	4,218	5,228	879	3,977
156044	214,797	2,887	36,307	1,302	5,865	10,606	1,743	6,677
156045	150,423	1,565	9,453	420	1,891	3,498	772	2,465
156051	434,396	6,239	35,613	1,292	7,459	10,243	2,340	6,839
156052	113,986	1,602	6,260	322	1,661	2,098	393	1,402
156053	134,897	2,127	7,125	436	2,395	2,356	478	2,096
156054	8,094	49	212	45	136	120	22	264
156061	109,262	1,944	14,623	414	3,244	3,019	587	2,148
156062	80,336	1,647	6,571	365	1,720	1,797	349	1,481
156063	12,589	495	1,683	107	701	399	70	529
156064	12,984	539	1,286	77	336	411	61	334
156065	41,313	1,620	4,615	289	2,282	1,701	398	1,571
Total	3,672,560	82,927	604,071	18,184	108,716	132,827	24,714	88,726

Financial services and insurance	Public administration and defense	Business services and real estate	Education	Health and social work
0.001372	0.031442	0.00782	0.058868	0.008295
0.001031	0.012365	0.003302	0.021861	0.006259
7.83E-05	0.005252	0.000274	0.002678	0.000382
0.000579	0.005588	0.000318	0.004775	0.001302
0.001401	0.014326	0.000794	0.011275	0.003088
0.000436	0.006606	0.002231	0.008418	0.004552
0.001207	0.007189	0.001263	0.01371	0.004128
0.000864	0.016111	0.00188	0.014208	0.006464
0.000848	0.006272	0.003469	0.019264	0.009892
0.000443	0.004194	0.000258	0.002325	0.002289
0.000155	0.004192	0.000343	0.005428	3.72E-05
0.000495	0.00587	0.000573	0.004007	0.001538
0.000506	0.001755	0.000443	0.00201	0.000658
6.79E-05	0.00016	0.000236	0.00027	0.000727
0.000284	0.004385	0.000434	0.003125	0.000831
0.000529	0.0052	0.000538	0.001824	0.001
5.54E-05	0.001692	0.000142	0.001084	0.000168
0.000531	0.001106	0.000517	0.003262	0.001983
0.000499	0.002726	0.000308	0.002692	2.45E-05
0.000296	0.004502	0.000677	0.003888	0.002363
0.000481	0.00497	0.000501	0.006839	0.001392
5.01E-05	0.001036	0.000712	0.005621	0.002804
8.47E-05	0.002422	0.000648	0.006837	0.002151
0.000239	0.02219	0.000284	0.007895	0.001507
0.000185	0.000435	0.000264	0.006641	0.001556
3.03E-05	0.000972	0.00039	0.002032	0.000673
0.001016	0.011719	0.000938	0.003251	0.001694
0.000131	0.006833	7.96E-05	0.006995	0.00047
0.001443	0.010863	6.92E-05	0.00416	0.002256

Other services	Other industry, n.e.c.	Unknown	Total
0.015772	0.001267	0.005587	0.916384
0.006173	0.001286	0.002764	0.865197
0.001303	0.000302	0.000375	0.097237
0.000426	0.000787	0.000348	0.09004
0.001465	0.000441	0.000649	0.137379
0.001556	0.00081	0.001523	0.565423
0.001883	0.000564	0.000259	0.340463
0.001519	0.000277	0.000255	0.41252
0.009832	0.000412	0.006051	0.999237
0.00056	1.65E-05	0.001558	0.182651
0.001456	4.69E-05	0.000436	0.267828
0.000284	0.000438	0.000386	0.152877
0.001517	1.22E-05	0.00021	0.069659
0.000205	0.000209	3.59E-05	0.036033
0.001956	0.000124	0.000332	0.122331
0.001587	0.00028	0.000746	0.210653
0.000817	0.00022	0.000487	0.056566
0.001212	9.41E-05	0.000554	0.125299
0.001346	0.000125	0.000331	0.043849
0.001397	1.24E-05	0.000762	0.225044
0.001332	0.000138	0.000478	0.188441
0.002159	0.000181	0.000831	0.243523
0.002567	0.000266	0.000825	0.239187
0.000764	4.42E-05	0.000967	0.285941
0.000843	0.000899	0.000102	0.066128
0.001217	0.000152	0.000155	0.153288
0.002246	0.000828	0.000237	0.128149
2.76E-05	0.001175	0.000376	0.105498
0.000647	0.000536	0.000504	0.128133
		Average	0.257068