

A Survey of the Recent Advances in Economic Development

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A Survey of the Recent Advances in Economic Development

Augusto Ricardo Delgado Narro[†]

Abstract

Recently a new set of sophisticated econometric and statistical methods, as non-linear panel data, spatial models, cointegration, unit root tests and so on, have been bringing back the classic discussion about economic development process. In this paper we discuss about the classical, new literature and empirical applications made about two main viewpoints. Firstly, the process of development for the developing countries toward their objective of being high-income countries and the trouble they face known as Middle-Income Trap (MIT, hereinafter). The second one, the development process inside countries toward the unique steady state. In this sense, we discuss the literature related with regional convergence and its variations.

The intent of these two viewpoints is the relevance for the growth and development economic literature related to the catch up process that economic units might have through them. Countries try to reach a certain income level, close the gaps between them but some of them face difficulties on that process. Regions are not different, they also try to close gaps between them. To sum up, the main objective of this survey is to show the literature discussion about these two viewpoints of development process amongst countries and amongst regions under two different perspectives and levels of the same problem, close gaps between economic units.

Keywords—Middle-Income Trap, Economic Convergence, β -convergence.

1 Introduction

Solow (1956) with his seminal papers on economic growth started a discussion about the idea that countries should approach toward certain level of income and in this process close the gaps between them, i.e. a convergence process. The empirical analysis shows a variety of results, convergence toward unique equilibrium; and in some other cases, conditioned convergence to the equilibrium under specific country characteristics. This idea of convergence between countries was rapidly

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transfer toward regions. If countries seems to be able to converge, the process inside looks be more reasonable since generally speaking regions tend to be more similar each other than countries.

All the discussion of closing gaps amongst countries with the goal of reach a certain level of income is not restricted to the “economic growth” theory. On the last decades, the fact that some countries have been struggling to reach a higher-income level got the attention of the “economic development” economists. The phenomenon was known as “Middle-Income Trap”. A sub-product obtained from the discussion of convergence process between countries.

In both cases, the academia has developed definitions and techniques in order to analyze them properly. In this sense, this paper contributes as a systematic compilation of the main literature related to “Economic Convergence” and “Middle-Income Trap” as parts of the development process of countries. In order to do the analysis from general to particular, we start with the “Middle-Income Trap” section since it only concern countries, while “Convergence” process consider also regions as units of analysis. Finally, the paper is divided as follow: Section 2 show the literature compilation about definitions of “Middle-Income Trap”, empirical evidences and the research agenda concerning to this topic. In a similar way, in Section 3, we present definitions of “Economic Convergence”, its variations, empirical evidences and the corresponding research agenda. Finally, we have conclusions in Section 4.

2 Economic Development: Middle-Income Trap

After the World War II, countries exhibited long period of progress and development in many senses, scientific evolution, access to health-care programs and better education. On this context, it results natural imagine that countries economy should end off on a better situation in compare to 50 years ago. Certainly the speed of development is not the same in each country, on the contrary, they face different and specific difficulties.

One of the objectives for every country is to belong to the club of developed or high-income economies. Every country tries to get into the club but not everyone can reach it. On the last four decades around 11 countries left the status of middle-income to be part of the group of high-income countries. Nonetheless, another group of more than 20 countries entered into this category. Additionally, around 40 countries have been staying into this group for more than two decades. In other words, a growing number of countries are stacked into the middle-income stage, like a rabbit in a trap. The literature called this phenomenon *Middle-Income Trap*. In this respect, the literature faces the problem of how to define and identify properly the phenomenon in order to find the main factors that explain the trap and establish policies to reduce any possible risk.

2.1 Definition of Middle-Income Trap

The idea of classifying the countries under certain criterion is not strange for economists. One of the most common categorizations is based on country's income levels: rich-poor, low-medium-high, developing-developed, and so on. However, with this categorization, it emerges the question of how to identify the proper thresholds between those categories? Many researches delimit proper definitions for the income categories, and there are plenty of them. In this subsection we present the most common of all of them. Economists turned to focus on the presence of struggles of development at the end of the nineties after the East Asian financial crisis (1997) when some countries were not be able to catch up their "rich" neighbors. The name of the phenomenon changed from "Catch up" process, low-equilibrium growth "trap", "poverty trap" until ends off as "Middle-Income Trap" on the 2000s. However, the main concept did not change much, the main idea is that countries have been facing the problem of moving their economies to higher development stages at the end.

In order to delineate and analyze the MIT, the World Bank classifies the countries based on their Gross National Income per capita: low-income (US\$ 1005 or less), lower-middle-income (between US\$ 1006 - US\$ 3975), upper-middle-income (US\$ 3976 - US\$ 12275) and high-income countries (US\$ 12276 or above). Some authors use similar classifications with the purpose of conducting their analysis of the trap as Aiyar et al. (2013), Eichengreen et al. (2011, 2013). However, these classifications result to be inconvenient since the thresholds are static and countries' economies would be changing over time. In that sense, Aiyar et al. (2013), in addition to the World Bank definition, propose a different approach by using growth slowdowns as a sustain deviation from their predicted growth path. Gill and Kharas (2007), on the other hand, define Middle-Income Trap when countries classified as middle-income economies grow less rapidly than either high or low-income countries.

Felipe et al. (2012) and Felipe (2012), from a different perspective, define MIT as the number of years it takes the transition from middle-income toward high-income stage. Eichengreen et al. (2011, 2013), additionally to the static classification of the MIT, they use growth slowdown rates to identify the trapped countries.

Finally, all the definitions presented in this subsection are summarized on Table 1.

2.2 Empirical Evidence

Regardless the proper definition of MIT, the search of accurate methodologies to analyze the MIT and detect what are the main factors that influence on this phenomenon also attracted the attention of economists. There are a vast methods used like Cross-Section, Panel Data, non-linear, time series, Bayesian models and so on in order to detect the variables that determine the existence and dynamic of the MIT.

Wu (2013) investigates the role of the productivity into the economic growth path by a cross-section model for the Chinese regional data in order to observe whether the regions can avoid the MIT, if

Table 1: Definitions for Middle-Income Trap.

Authors	Variable	Definition
Gill and Kharas (2007)	GDP per capita growth rates	MIT: middle-income economies grow less rapidly than either higher low-income countries.
Felipe et al. (2012); Felipe (2012)	GDP per capita in 1990 PPP dollars	MIT: if a country has been longer in the middle-income group than other countries have on average.
Eichengreen et al. (2011, 2013)	GDP in 2005 constant international PPP	MIT: growth slowdown as a decline in the seven-year average growth rate of per capital GDP by at least by 2 percentage points and limited to cases in which per capita GDP is greater than 10,000 US\$.
Aiyar et al. (2013)	GDP in 2005 constant international PPP	MIT as large sudden and sustained deviations from the growth path predicted by a basic conditional convergence framework.

regions can avoid the MIT then the country might be able to avoid the trap as well. The results show the importance of productivity, high-income regions tend to follow a stable growth path by receiving the benefits from the technological progress. These technological benefits are not clear for middle and low-income regions. The author sustains that this results can be transferred to analyze countries from a similar viewpoint. Also, Islam et al. (2013) also analyze China and its chance to lie into the MIT. They highlight that a persistent income inequality might increase the probability to stay into the MIT.

The analysis of the MIT cannot be done only with domestic variables; it also requires the addition of international factors. In this sense, Fortunato and Razo (2014) takes an international trade viewpoint of the MIT by creating an Index of Sophistication of exports based in three steps: i) establish a relationship between the GDP per capita and exports, ii) the link between income and exports basket, and finally, iii) create the Index of Sophistication by normalizing the exports sophistication level obtained on the previous steps. They find that some factors are relevant on the route to be high-income country: diversification, innovation and education. Those changes are not automatic and many countries fail to impulse them lying into the MIT. Kumagai (2015) also analyzes the MIT by incorporating international trade variables into a Panel Data model. He shows that trapped countries depend on their commodities exports and narrow export base, then the MIT is a sort of *Dutch disease* for middle-income economies due to their economic structure.

Using the definition of Felipe et al. (2012), Van der Hout (2014) finds that inclusiveness is a key variable to avoid lie into the trap and it is based in four indicators: female educational attainment, life expectancy, economic inclusiveness, and political freedom & civil liberties. With similar conclusions,

Ito (2017) analyzes the process of growth convergence related with the MIT for the Asian countries toward their US GDP level. MIT occurs when a country fails to jump and converge to a high-income steady state and it requires reform their policies and stimulate innovation in order to avoid the trap. Arias and Wen (2016), by using a first-order Markov chains, they calculate the probabilities of a country to move from one range of income to another range of income, where each range classifies a country as low, middle or high-income economy, i.e. the transition probabilities to move from one income stage to another. They show that relative low-income countries fail more persistently than middle-income countries to upgrade their status to higher income levels. Additionally, a big number of trapped countries into the MIT are found in Latin America while in Africa countries lie into a *low-income trap* with more frequency. Traps are defined when the probabilities to stay into the same stage amongst time is high.

Yülek (2017) focuses his analysis in the industrialization process as a tool to escape from the MIT. The author identifies the key sectors where the industry policy must focus since it tends to be crucial especially on the middle-income stage. Those policies must consider the generation of added value, linkages to related sectors, technological progress and a potential learning for future new sectors in order to develop adaptabilities into economies. Bulman et al. (2017) by using a Pooled Panel Data model, with a similar idea, they suggest that middle-income countries might shift their grow strategies in order to have a smooth transition to higher stages.

Finally, all the definitions presented in this subsection are summarized on Table 2.

2.3 Agenda

The literature shows a vast variety of definitions and methods to identify and explain precisely the MIT phenomenon. Nevertheless, it remains some topics where the literature is scarce.

On the development process the strength of domestic variables and the fundamentals, are crucial for the objective of moving the economy to the following step. However, under an international scenario where the trade and interrelation between economies are getting important, the literature left this fact aside and mostly focuses on only domestic covariates. There is not enough literature that analyzes the effect of economic crisis, external shocks or even international conflicts over the probability of surrounding economies to lie into the MIT. Additionally, the role of biggest economies was left aside. For example, the roles of Japan, China, India, Germany and others have over the chance of developing economies to avoid the trap. All those topics appear as interesting starting point for researches who are willing to analyze the development process amongst countries.

3 Economic Convergence

The idea of understanding the catching up process of relative poor economies to rich ones has been

Table 2: Empirical Evidences Summarize for the Middle-Income Trap.

Authors	Country & Period	Methodologies	Findings
Islam et al. (2013)	China 1970-2009	Distribution Analysis	Inequality increases the probability to lie into the MIT.
Wu (2013)	China 1971-2010	Cross-Section & Panel Data	The productivity and technology process are keys to avoid the MIT.
Fortunato and Razo (2014)	158 Countries 1996-2008	Cross-Section	A sophistication on the export basket is crucial to reduce the chance to lie into the MIT.
Van der Hout (2014)	124 Countries 1970-2010	Theoretical (Non- econometric Model)	Inclusiveness is key variable based in: female educational attainment, life expectancy, economic inclusiveness, and political freedom & civil liberties.
Kumagai (2015)	198 Countries 1960-2000	Panel Data	Three stages of development linked with three main factors: diversification, innovation and education.
Arias and Wen (2016)	107 Countries 1950-2011	Markov Chains	The MIT is a persistent phenomom specially for LA countries.
Bulman et al. (2017)	143 Countries 1960-2009	Pooled Panel Data	Strategies of development should change according to the stage of development.
Ito (2017)	ASEAN-5 (10 Countries) 1985-2015	Cross-Section, times series and Pooled Regression	To get out the MIT, countries need to reform their policies and stimulate innovation.
Yülek (2017)	-	Author's Indicator	The industry policy tends to be crucial especially on the middle-income stage.

attracting the attention of economists for long time. They called this process as *economic convergence*. The analysis of convergence started with countries and was transfer toward regions in order to confirm the presence of economic convergence and identify the factors that influence on the catching up process.

3.1 Definition of Economic Convergence

Even when the concept of *economic convergence*, process in which relative poor regions grow until catch up rich regions, results to be simple and easily understood, there are many ramifications and many methodologies that fit in order to analyze them. In this section we present the main established concepts about convergence.

Solow (1956) proposed a basic economic model to analyze the growth process under the conditions of diminishing return of scale, inputs (labor and capital) and exogenous technological progress. Kaldor (1971), on this way, highlights this growth theory by his six stylized facts, which are well known on the literature.

Until the nineties the main idea of convergence was based on diminishing return of scale, which implies higher marginal productivity on the capital factor in the relative poor regions. With the rest

of variables in similar conditions, poorer regions grow faster and eventually catch up richer regions. This process establishes a primary negative relationship between the initial income level with the consequent growth rate. When this concept of convergence was transferred toward equations, the coefficient of the initial income variable on the regressions was called β , and captured the negative relation between those variables. Finally, this idea of convergence is known as β -convergence.

On the nineties, a new perspective of convergence appears under the main works of Quah (1997) and Friedman(2015). They criticize that β -convergence does not care about the dispersion of the regional incomes in each period of time, a negative relationship between the initial income level and the growth rate does not imply less dispersion between regions. According to this new perspective, instead of focus on β , convergence should focus on the dispersion's dynamic. This perspective is known as σ -convergence. For more references, see Quah (1996), Durlauf and Quah (1998), and Young et al. (2003).

From the concept of β -convergence and the model proposed by Solow (1956), $Y = K_t^\alpha (A_t L_t)^{(1-\alpha)}$, the steady state income level depends of those elements: capital, technology, population and α parameter. Under this model proposed, two convergence concepts appear. The *unconditional convergence* which implies that all elements are the same for all the considered economies, it means, the β is negative regardless other variables that can be included as possible explanatory variables. On the other hand, the *conditional convergence* recognizes possible differences in the steady state and it requires a proper set of variables to include on the basic growth model. Both of these previous concepts are based on the idea of uniqueness for the equilibrium. For the *unconditional convergence* since all the determinants elements are the same for all economies, they approach toward unique steady state, that is why this type of convergence is also known as "Absolute Convergence". In contrast, for the *conditional convergence*, the equilibrium is defined by their particularities in each element, so their steady states are different and each economy approaches to its own but unique equilibrium, also known as "Relative Convergence". (Romer, 1986; Sala-i Martin, 1994, 1996a, b).

The idea of multiple equilibrium in the convergence appears as a natural variation of the unique equilibrium concept explained on the previously. This new concept is well known in the literature as *club-convergence*. In this concept a group of economies may approach to a particular steady state if they share similar economic conditions conforming then a club of convergence. (Baumol, 1986; Durlauf and Johnson, 1995; Bernard and Durlauf, 1996).

Under the concept of β -convergence two main ramifications appeared: one, the concept of β -convergence itself; and the second one, the stochastic convergence. The first concept of β -convergence is related with the ideas of unconditional, conditional and clubs of convergence since amongst them it is possible to identify the negative relationship between the initial conditions and the growth rate, i.e. β . However, the second concept of stochastic convergence chronologically appears on the nineties with the works of Carlino and Mills (1993), Bernard Durlauf (1995), Evans (1996), and

Evans and Karras (1996) by analyzing the convergence process with time series econometric tools. The main idea of the stochastic convergence is to investigate the presence of possible permanent shocks into the income series that can make the economy move out far from the steady state. In other words, the stochastic convergence looks for the presence of “stochastic” trends in the deviation series between the income and the steady state.

Finally, all the definitions presented in this subsection are summarized on Table 3.

3.2 Empirical Evidence

There are plenty varieties of methodologies than can be used to analyze convergence on its different approaches as cross-section, panel data, time series, cointegration, spatial cross-section, spatial panel data and distribution approaches.

Barro and Sala-i Martin (1990), Barro (1992), Barro and Sala-i Martin (2004) and Sala-i Martin (1996b) analyzed the β -convergence for the US case finding evidence of unconditional convergence between the states between 1880-2000, even the convergence is kept for sub-periods of ten years. Sala-i Martin (1996b) finds evidence of β -convergence for 1950-1990 for five countries (Germany, France, United Kingdom, Italy and Spain) of the Organization for Economic Cooperation and Development (OECD) and also amongst those countries. Barro and Sala-i Martin (1992) analyze all 47 Japanese Prefectures and find evidence of β -convergence between 1930-1990; however, due to the presence of outliers and relevant structural breaks it was not possible to corroborate the robustness of the β -convergence in sub-periods. Other important related references are: Barro and Sala-i Martin (1995),

Table 3: Definitions for Economic Convergence.

Concept	Definition
<i>β-convergence</i>	
Unconditional Convergence or Absolute Convergence	Negative relationship between the initial income and the growth rate independently of all covariates except capital, technology, population and a parameter of Solow equation. i.e. All economies converge toward unique steady state.
Conditional Convergence or Relative Convergence	Negative relationship between the initial income and the growth rate and it can be affected by the covariates included. i.e. Each economy converge toward its own steady state.
Club of Convergence	A group of economies approach to a particular steady state if they share similar economic conditions conforming a club. i.e. A set of economies converge toward a certain steady state while other set converge to another one, and so on.
<i>Stochastic Convergence</i>	
	The stochastic shocks in the deviation series between income and steady state are not permanent.
<i>σ-convergence</i>	
	The dispersion of the economies income decrease through the time

Mankiw (1995), Lichtenberg (1994), Durlauf and Johnson (1995), and De la fuente (1997, 2003).

On the other hand, Siriopoulos and Asteriou (1997) for the case of Greece, they do not find evidence of *unconditional convergence* amongst the regions, even when they sub-divide the period of 1971-1996 into three parts. They suggest the possible separate steady states due to the dualities between north and south of Greece. Nagaraj et al. (1998) find evidence of conditional convergence inside the regions of India for the period between 1960-1994, as well as for the States that share similar financial characteristics of infrastructure and education. Mitchener and McLean (1999) highlight the role of labor productivity and the location on the convergence process between the states of US between 1880-1980.

For Latin America, Serra et al. (2006) do not find important evidence of regional convergence in the last 30 years. They also find that Argentinian regions do not converge, while the regions of Brazil, Colombia and Chile do converge in an unconditional manner. Cabrera-Castellanos (2002) finds *unconditional convergence* for the period between 1970-1995 in Mexico. For Peru, Delgado and Del Pozo (2011) do not find evidence of *unconditional convergence* amongst provinces between 1970-2008. However, they show some evidence of *conditional convergence* in sub-periods.

Fukao et al. (2015) analyze the presence of β -convergence for the case of Japan between 1955-2008. They find evidence that the Total Factor Productivity (TFP) is the main source of inequality amongst Prefectures. Finally, the β -convergence is confirmed since poorer prefectures received private capital inflows and/or government capital transfers.

Respect to the clubs of convergence concept, Phillips and Sul (2009) are pioneers in applying econometric tools developed by themselves in order to identify the number of clubs and the regions that are included into them. The authors incorporate the possibility of heterogeneity in the patterns of growth as a consequence of technological discrepancies. They use three panels for their study: the first one uses 48 states of the US between 1929 and 1998; the second consists of 127 countries between 1950 and 2001; and the third includes 152 countries from 1970 to 2003 and 98 countries from 1960 to 2003. They do not find evidence of absolute convergence for the states of the US and for the case of the second and third panel, the authors find evidence of five clubs of convergence.

From a different perspective, Shibamoto et al. (2016) by using Panel Cointegration approach, they find evidence of no convergence amongst the Japanese prefectures. Moreover, they classified the prefectures in follower and leader ones and assume as clubs with possibility of convergence amongst them. Finally, they highlight the effect of TFP, Labor productivity and Real Capital on the convergence process as key variables.

Respect to the concept of stochastic convergence, Carlino and Mills (1993) analyze the regional per capita incomes for US between 1929-1990 by using time series model and finding evidence of persistent shocks. Nonetheless, when they incorporate a structural break in 1946, they get results that are consistent with the existence of stochastic convergence on the per capita incomes. Loewy

and Papell (1996) conduct tests of unit root to the series of per capita income in eight regions of the United States and they incorporate the possibility of an unknown structural breaking point. Finally, they find stochastic convergence in seven out of eight regions. Another application for Chile, we have Duncan and Fuentes (2005), that compare the application of times series approach with the classical cross-section and panel data analysis. Finally they find evidence of *unconditional convergence* between the regions in Chile.

The analysis of convergence with time series do not consider the existence of spillovers between regions that economically interact. On the contrary, spatial models contemplate the heterogeneity effect and give us measure of the indirect effect produced by the spatial interaction.

In this sense, Arbia et al. (2006) and Arbia and Piras (2007) use spatial panel data models to analyze the growth rate behavior across the regions in Italy over 1950-2000 divided into subperiods. After they control the fixed-effects to avoid the problems of heterogeneity, omitted variables and structural breaks, they find that the speed of convergence with spatial lag models is lower than non-spatial fixed-effect models. From a country perspective, Liu and Ruiz (2006) propose an empirical analysis for testing the convergence amongst 24 countries from the OECD during 1953-2000. They apply a panel unit root test and find output conditional convergence amongst the OECD countries with lower speed of convergence in compare to conventional panel without taking in account the spatial effect.

Madariaga et al. (2005) use a spatial correlation and first-differenced GMM estimators in a spatial panel data model for 23 Argentinian provinces over 1983-2002. They sustain that ignoring the spatial distortion generates bias and overestimate the speed of convergence especially for regions far from the economic center. Seya et al. (2012) investigate the income disparities in Japan after the bubble burst in early 1990s. By using municipality level data from 1989-2007 and Bayesian Spatial Durbin model, they do not find evidence of reduction of disparities over the income per capita. Prochniak and Witkowski (2014) confirm the presence of GDP convergence among 28 European countries from 1993-2013 by using spatial Durbin-Watson model. The convergence parameter estimated is 9.3%, significantly lower than non-spatial one of 17.3%. Lim and Kim (2015) analyze 177 economic areas in US for 1969-2009 by using the per capita incomes and time-period fixed effects spatial error model. The shocks originated on the first-order spatial neighbors are statistically significant and affect the convergence. Qin et al. (2017) try to find spatial convergence inland China by the case of Zhongyuan area from 1993-2009. They criticize that the Barro and Sala-i-Martin convergence concept is limited by the temporal concept, in this sense, they find evidence of spatial club of convergence in the 56 regions of Zhongyuan. The convergence rates were 2% for 1993-1999 and 1% for 1993-2009.

Finally, empirically it seems that time series econometric methodologies tends to overestimate the parameters of convergence since it does not take into account the spillover between countries or regions that are connected in some way. The spatial models correct the problem and let us estimate convergence parameters more accurately over time. (See a summarize of the empirical evidences in

Table 4)

3.3 Agenda

The investigation on convergence between countries and regions seems to be vast and well developed by the literature. However, it results that still some topics deserve new researches. For example, the club of convergence, which might be easy to understand but complicate to analyze actually, seems to need a deeper analysis in order to identify them in more accurate way and establish for example the number of clubs and regions that conform them.

Another topic that deserves more research is the analysis of convergence by using spatial methodologies. Even when some papers use spatial econometrics as a tool, the number of applications for regional analysis remains limited.

4 Conclusions

It is clear the evolution on defining and identifying the concepts of “Middle-Income Trap” and “Economic Convergence”. Respect to the MIT, the literature show a variety of definitions for the trap and its influence on the empirical results. In this sense, most of authors focus on domestic variables as key factors to determinate the probability to lie into the MIT. Others innovated by incorporating external variables like trade as key factors that affect the probability of a country to be trapped. However, neither of them consider the impact of other economies that might have on the chance to be trapped. This constitute an open agenda for further researches.

On the other hand, for the case of convergence, the literature has a vast range of methods to identify the type of convergence and measure it. However, even when β -convergence concept is simple, the analysis of clubs of convergence remains enigmatic due to its difficulty to identify and measure it. In this sense, the agenda for new researches is, firstly, develop new accurate methods to identify the number and members of clubs if exist as Phillips and Sul (2007) did. Secondly, the analysis of convergence from a spatial perspective due to the spatial spillovers are captured.

References

- AIYAR, S., R. DUVAL, D. PUY, Y. WU, AND L. ZHANG (2013): “Growth Slowdowns and the Middle-Income Trap IMF Working Paper Asia and Pacific Department Growth Slowdowns and the Middle-Income Trap Authorized for distribution,” *IMF Working Paper*, 13, 1-61.
- ARBIA, G., R. BASILE, AND G. PIRAS (2006): “Using Spatial Panel Data in Modelling Regional Growth and Convergence,” *Ssrn*, 1-31.
- ARBIA, G. AND G. PIRAS (2007): “Convergence in Per-capita GDP across European Regions using Panel Data Models Extended to Spatial Autocorrelation Effects,” *SSRN Electronic Journal*, LXVII, 157-172.

Table 4-A: Empirical Evidences Summarize for Economic Convergence.

Authors	Country & Period	Methodologies	Findings
<i>β-convergence</i>			
Barro and Sala-i Martin (1990)	US states 1929-1988	OLS Cross-Section	Evidence of β -convergence (unconditional) even in sub-periods of time.
Barro (1992)	US states 1840-1988	Cross-Section	Evidence of convergence for the states of US in unconditional way.
Sala-i Martin (1996b)	US (1880-1990); Japan (1955-1990), Germany, UK, France, Italy, Spain (1950-1990) & Canada (1961-1991)	OLS and Panel Data	There is an evidence of σ and β -convergence for all countries analyzed.
Barro and Sala-i Martin (1992)	US (1880-1988) and Japan (1930-1987) 1970-2010	OLS Cross-Section	Evidence of convergence amongst the sub national economies in both countries in σ and β -convergence way. Highlights the role of migration to obtain conditional convergence process.
Durlauf and Johnson (1995)	98 Countries 1960-1985	OLS Cross-Section	β conditional convergence across countries.
De la fuente (2003)	OECD Countries 1970-1995	OLS including trend	Convergence in income per capita with relevant effect of diminishing return of scale and technology.
Siriopoulos and Asteriou (1997)	Greek regions 1971-1996	OLS Cross-Section	There is no evidence of convergence in any types. However, the north and south regions seem to give evidence of dualism into the country.

Table 4-B: Empirical Evidences Summarize for Economic Convergence.

Authors	Country & Period	Methodologies	Findings
Nagaraj et al. (1998)	India regions 1960-1994	Panel Data	Evidence of conditional convergence amongst the Indian regions. Highlight the roles of: structure of production, infrastructure, and fixed effects.
Mitchener and McLean (1999)	US 1880-1980	OLS Cross-Section	Importance of productivity regions in driving convergence of different series at different points of time.
Serra et al. (2006)	Argentina, Brazil, Chile, Colombia, Mexico, Peru 1970-2000	Nonlinear Least Squares	There is evidence of conditional convergence. However, for the case of Brazil and Peru, there is a clue of possible club of convergence. There is an important role of trade liberalization.
Cabrera-Castellanos (2002)	Mexico 1870-1995	OLS Cross-Section and time series	Evidence of β absolute convergence.
Delgado and Del Pozo (2011)	Peru 1879-2008	Panel Data	Evidence of conditional convergence between the regions.
Fukao et al. (2015)	Japan 1955-2008	Panel Data	Importance of Total Factor Productivity to show evidence of conditional convergence amongst the Japanese Prefectures.

Table 4-C: Empirical Evidences Summarize for Economic Convergence.

Authors	Country & Period	Methodologies	Findings
<i>Clubs of Convergence</i>			
Phillips and Sul (2009)	US (1929-1998), OECD (1870-2001), 18 Countries 1880-1980	Phillips and Sul's algorithm - Logt regression	There is no strong evidence of unconditional convergence amongst the economies analyzed. On the contrary, the tests show evidence of clubs of convergence in each data set.
Shibamoto et al. (2016)	Japan 1955-1999	Panel Cointegration	Prefectures do not converge due to strong heterogeneity between them.
<i>Stochastic Convergence</i>			
Carlino and Mills (1993)	US 1929-1990	Time series	Evidence of stochastic convergence. After considering the break in 1946, they find evidence of conditional convergence.
Loewy and Papell (1996)	US 1929-1990	Time series	Stochastic convergence in 3 of 8 considered regions. However, after including endogenous break detection the significance of stochastic convergence increase for 7 of 8 regions.
Duncan and Fuentes (2005)	Chile 1960-2000	Panel Data and times series	The presence of β unconditional convergence is confirmed.

Table 4-D: Empirical Evidences Summarize for Economic Convergence.

Authors	Country & Period	Methodologies	Findings
<i>Convergence with Spatial Effects</i>			
Arbia and Piras (2007)	EU 1978-2002	Spatial Panel Data	Improve on the estimated values of the speed of convergence.
Liu and Ruiz (2006)	OECD 1953-2000	Panel Data Unit Root test with Spatial Dependence	There is conditional convergence between countries, however, the speed of convergence is overestimated by non-spatial models.
Madariaga et al. (2005)	Argentina 18983-2002	Dynamic Panel with Spatial Autocorrelation	Ignoring the spatial distortions underestimates the speed of convergence. There is evidence of agglomeration between provinces.
Seya et al. (2012)	Japan 1990-2007	Bayesian Spatial Durbin Model	β -convergence is hold while σ -convergence is rejected. It is important to consider the bubble in the equation.
Prochniak and Witkowski (2014)	EU 1993-2013	Spatial Durbin Model	Evidence of GDP conditional convergence with a speed of convergence significantly lower than non-spatial cases.
Lim and Kim (2015)	US 1969-2009	Spatial Panel Data	There is a spatial effect between states that can expand the effect of any external economic shock. There is evidence of spatial unconditional convergence.
Qin et al. (2017)	China 1993-2009	Spatial OLS	There is spatial club of convergence for the period of analysis.

ARIAS, M. A. AND Y. WEN (2016): "Relative income traps," *Federal Reserve Bank of St. Louis Review*, 98, 41-60.

BARRO, R. (1992): "Convergence," *Journal of Political Economy*, 100, 223-251.

BARRO, R. AND X. SALAI MARTIN (1990): "Economic Growth and Convergence across The United States," Tech. Rep. August, National Bureau of Economic Research, Cambridge, MA.

—— (1992): "Regional Growth and Migration: A Japan-U.S. Comparison," Tech. Rep. 4038, National Bureau of Economic Research, Cambridge, MA.

—— (1995): "Technological Diffusion, Convergence, and Growth," Tech. rep., National Bureau of Economic Research, Cambridge, MA.

—— (2004): *Economic Growth*, London, England: Massachusetts Institute of Technology.

BAUMOL, W. J. (1986): "Productivity Growth, Convergence, and Welfare: What the Long-Run Data Show," *The American Economic Review*, 76, 1072-1085.

BERNARD, A. B. AND S. N. DURLAUF (1995): "Convergence in international output," *Journal of Applied Econometrics*, 10, 97-108.

—— (1996): "Interpreting tests of the convergence hypothesis," *Journal of Econometrics*, 71, 161-173.

BULMAN, D., M. EDEN, AND H. NGUYEN (2017): "Transitioning from low-income growth to high-income growth: is there a middle-income trap?" 22, 5-28.

CABRERA-CASTELLANOS, L. F. (2002): "Convergence and Regional Economic Growth in Mexico: 1970-1995," *Munich Personal RePEc Archive*, 4026, 1-32.

CARLINO, G. A. AND L. O. MILLS (1993): "Are U.S. regional incomes converging?. A time series analysis," *Journal of Monetary Economics*, 32, 335-346.

- DE LA FUENTE, A. (1997): "The empirics of growth and convergence: A selective review," *Journal of Economic Dynamics and Control*, 21, 23-73.
- (2003): "Convergence Equations and Income Dynamics: The Sources of OECD Convergence, 1970-1995," *Economica*, 70, 655-671.
- DELGADO, A. AND J. DEL POZO (2011): "Convergencia y ciclos económicos departamentales en el Perú : 1979-2008," *Pontificia Universidad Católica del Perú - PUCP Consorcio de Investigación Económica y Social*, 1-82.
- DUNCAN, R. AND J. R. FUENTES (2005): "Convergencia regional en Chile: nuevos tests, viejos resultados," *Central Bank of Chile Working Papers*, 313, 1-40.
- DURLAUF, S. AND D. QUAH (1998): "The New Empirics of Economic Growth," Tech. rep., National Bureau of Economic Research, Cambridge, MA.
- DURLAUF, S. N. AND P. A. JOHNSON (1995): "Multiple regimes and cross-country growth behaviour," *Journal of Applied Econometrics*, 10, 365-384.
- EICHENGREEN, B., D. PARK, AND K. SHIN (2011): "When Fast Growing Economies Slow Down: International Evidence and Implications for China," Tech. Rep. 1, National Bureau of Economic Research, Cambridge, MA.
- (2013): "Growth Slowdowns Redux: New Evidence on the Middle-Income Trap," Tech. rep., National Bureau of Economic Research, Cambridge, MA.
- EVANS, P. (1996): "Using cross-country variances to evaluate growth theories," *Journal of Economic Dynamics and Control*, 20, 1027-1049.
- EVANS, P. AND G. KARRAS (1996): "Convergence revisited," *Journal of Monetary Economics*, 37, 249-265.
- FELIPE, J. (2012): "Tracking the Middle-Income Trap: What is it, Who is in it, and Why? Part 2," *SSRN Electronic Journal*, 2-30.
- FELIPE, J., A. ABDON, AND U. KUMAR (2012): "Tracking the Middle-Income Trap: What is it, Who is in it, and Why?" *SSRN Electronic Journal*, 1-40.
- FORTUNATO, P. AND C. RAZO (2014): "Export sophistication, growth and the middle-income trap," in *Transforming economies: Making industrial policy work for growth, jobs and development*, ed. by J. M. Salazar-Xirinachs, I. Nübler, and R. Kozul-Wright, Geneva: International Labour Organization 2014, chap. 9, 267-287, first edit ed.
- FRIEDMAN, M. (2015): "Do Old Fallacies Ever Die?" *Journal of Economic Literature*, 30, 2129-2132.
- FUKAO, K., T. MAKINO, AND J. TOKUI (2015): "Regional Factor Inputs and Convergence in Japan: A macro-level analysis, 1955-2008," *RIETI Discussion Paper Series*, 15, 1-34.
- GILL, I. AND H. KHARAS (2007): "Successful Growth in Middle Income Countries: Will East Asia Show the Way Again?" *The Egyptian Center for Economic Studies*, 1-21.
- ISLAM, N., UNITED NATIONS, AND ICSEAD (2013): "Beyond the middle income trap: What kind of high income country can China become?" *International Centre for the Study of East Asian Development*, 2013, 1-27.
- ITO, T. (2017): "Growth Convergence and the Middle-Income Trap," *Asian Development Review*, 34, 1-27.
- KALDOR, N. (1971): "Conflicts in National Economic Objectives," *The Economic Journal*, 81, 1-17.
- KUMAGAI, S. (2015): "The Middle-Income Trap from the Viewpoint of Trade Structures: Are the Geese Trapped or Still Flying?" *Journal of International Commerce, Economics and Policy*, 06, 1-33.
- LICHTENBERG, F. R. (1994): "Testing the Convergence Hypothesis," *The Review of Economics and Statistics*, 76, 576-579.
- LIM, U. AND D. KIM (2015): "Toward sustainable economic growth: A spatial panel data analysis of regional income convergence in US BEA economic areas," *Sustainability (Switzerland)*, 7, 9943-9959.
- LIU, L. AND I. RUIZ (2006): "Convergence Hypothesis: Evidence from Panel Unit Root Test with Spatial Dependence," 37-56.
- LOEWY, M. B. AND D. H. PAPELL (1996): "Are U.S. regional incomes converging? Some further evidence," *Journal of Monetary Economics*, 38, 587-598.
- MADARIAGA, N., S. MONTOUT, AND P. OLLIVAUD (2005): "Regional convergence and agglomeration in Argentina : a spatial panel data approach," *Cahiers de la Maison des Sciences Economiques*, 106-112.

- MANKIW, N. G. (1995): "The Growth of Nations," *Brookings Papers on Economic Activity*, 275- 326.
- MITCHENER, K. J. AND I. W. MCLEAN (1999): "US Regional Growth and Convergence, 1880- 1980," *The Journal of Economic History*, 59, 1016-1042.
- NAGARAJ, R., A. VAROUDAKIS, AND M.-A. VEGANZONES (1998): "Long-run growth trends and convergence across Indian States," *OECD Development Centre Working Papers*, 131, 1-56.
- PHILLIPS, P. C. AND D. SUL (2007): "Transition modeling and econometric convergence tests," *Econometrica*, 75, 1771-1855.
- (2009): "Economic transition and growth," *Journal of Applied Econometrics*, 24, 1153-1185.
- PROCHNIAK, M. AND B. WITKOWSKI (2014): "Alternative Weighting Schemes in Spatial Analysis of GDP Per Capita Convergence," *Quantitative Methods in Economics*, XV, 198-208.
- QIN, C., X. YE, AND Y. LIU (2017): "Spatial club convergence of regional economic growth in inland China," *Sustainability (Switzerland)*, 9.
- QUAH, D. (1997): "Empirics for growth and distribution: stratification, polarization, and convergence clubs," *Journal of economic growth*, 2, 27-59.
- QUAH, D. T. (1996): "Empirics for economic growth and convergence," *European Economic Review*, 40, 1353-1375.
- ROMER, P. M. (1986): "Increasing Returns and Long-Run Growth," *The Journal of Political Economy*, 94, 1002-1037.
- SALA-I MARTIN, X. (1994): "Cross-sectional regressions and the empirics of economic growth," *European Economic Review*, 38, 739-747.
- (1996a): "Regional cohesion: evidence and theories of regional growth and convergence," *European Economic Review*, 40, 1325-1352.
- (1996b): "The Classical Approach to Convergence Analysis," *The Economic Journal*, 106, 1019-1036.
- SERRA, M. I., M. F. PAZMINO, G. LINDOW, B. SUTTON, AND G. RAMIREZ (2006): "Regional Convergence in Latin America," *IMF Working Paper*, 06, 1-29.
- SEYA, H., M. TSUTSUMI, AND Y. YAMAGATA (2012): "Income convergence in Japan: A Bayesian spatial Durbin model approach," *Economic Modelling*, 29, 60-71.
- SHIBAMOTO, M., Y. TSUTSUI, AND C. YAMANE (2016): "Understanding regional growth dynamics in Japan: Panel co-integration approach utilizing the PANIC method," *Journal of the Japanese and International Economies*, 40, 17-30.
- SIRIOPOULOS, C. AND D. ASTERIOU (1997): "Testing the convergence hypothesis for Greece," *Managerial and Decision Economics*, 18, 383-389.
- SOLOW, R. M. (1956): "A Contribution to the Theory of Economic Growth," *The Quarterly Journal of Economics*, 70, 1-65.
- VAN DER HOUT, A. (2014): "Escaping the Middle-Income Trap: The Importance of Inclusiveness for Further Growth," Ph. D. thesis, Erasmus University Rotterdam.
- WU, Y. (2013): "Productivity, Economic Growth and Middle Income Traps: Implications for China," *Preliminary Draft*, 1-28.
- YOUNG, A. T., M. J. HIGGINS, AND D. LEVY (2003): "Sigma Convergence Versus Beta Convergence: Evidence from U.S. County-Level Data," *SSRN Electronic Journal*, 40.
- YÜLEK, M. A. (2017): "On the Middle Income Trap, the Industrialization Process and Appropriate Industrial Policy," *Journal of Industry, Competition and Trade*, 17, 325-348.