

Economic Growth Analysis and Total Factor Productivity: A Case Study of Morocco, 1999-2019

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Abstract

There is no doubt about the importance of economic growth for raising individuals' income and country's wealth. But, this becomes problematic when it does not depend on inputs and depends on something else. This paper aims to address total factor productivity and its interactions with sources of growth with an application to the Moroccan economy.

Keywords: production function, capital stock, labor factor, Solow residual, total factor productivity, contribution of inputs to growth

1. Introduction

Economic growth is the main concern of the economic authorities of any country since it contributes to the creation of wealth and, consequently, to the improvement of the well-being of its population. Thus, different economic policies are implemented to achieve this economic growth in a world characterized by an increased globalization of markets and an increasingly important integration of national economies within the world economy. The ultimate goal of this search for growth is to create employment while setting up production systems that combine inputs in an effective and efficient way.

Therefore, the analysis of the productive structures of an economy is an essential step to know their characteristics and to look for factors, other than capital and labor, that come into play to contribute inexplicably to growth.

This paper is an attempt to quantify growth by focusing primarily on total factor productivity (hereafter TFP). It seeks to find a link between all the factors within the production process, mainly everything related to TFP, by adopting an econometric approach which has been favored to approach the main characteristics of the productive system despite the existence of several other methods of determining TFP.

Thus, this article is structured as follows: the first part is reserved for a brief description of the socio-economic and political situation in Morocco. In the second part, we will present a review of the literature on TFP, while the third part will be devoted to the statistical data used. Finally, the last part will be devoted to the different empirical results obtained.

2. Brief Overview of the Socio-Economic and Political Situation in Morocco

After its independence in 1956, Morocco has made enormous efforts to improve the well-being of its population. For that purpose, it began as early as 1960 to draw up economic and social development plans, which the first one was the 1960-1964 plan. The objective of these plans was to set up economic and social infrastructures in order to meet the economic and social needs of the population.

Moreover, given its agricultural vocation, Morocco opted for the construction of several dams to ensure the irrigation of its arable land. The objective of this policy was to reach one million irrigated hectares and ensure the food security for its population.

Unfortunately, the global economic problems of the 1970s and 1980s, combined with the fall in phosphate prices, of which Morocco is the world's main producer, plunged the country into economic and social crises and debt, and Morocco was forced to abandon its development plans and adopt Structural Adjustment Plans (SAPs) for a

decade (from 1983 to 1992). This SAP period was characterized by numerous economic reforms to 1) restore the main macroeconomic balances, 2) improve and diversify its production's supply, 3) make the productive system more efficient by transferring the ownership of some public enterprises to the private sector and reduce the economic preponderance of the public sector and, finally, 4) allow the private sector to develop and contribute to the creation of wealth in the country (by ousting the public sector from some productive sectors).

After the fall of the "Berlin Wall" in 1989 and the abandonment of planning at the global level, Morocco has also abandoned development plans which the last one was for the period 2000-2004. These national economic and social development plans have been replaced by sectoral strategies such as the Green Morocco Plan for agriculture, the Halieutis Plan for fishing, the Emergence Plan for industry, etc.

In terms of growth, despite all the efforts made, economic growth in Morocco has remained timid and has not evolved remarkably since real GDP growth has not exceeded the rate of 3.7% for the period 1980-2020 compared to 4.9% for the period corresponding to the structural adjustment (1983-1992) and 3.6% for the period 1999-2020.

On the social level, and as a consequence of the years of adjustment when priority was given to restoring macroeconomic balances, Morocco is lagging behind in social development as shown by the country's ranking according to the Human Development Index (HDI), published by the United Nations Development Program (UNDP). Thus, according to this indicator, Morocco was ranked 124 out of a basket of 174 countries in 1999 against a 121st position out of a basket of 189 countries in 2019.

This "social" backwardness has pushed Morocco to start several social projects, such as :

1) the revision of the Moudawana (or Moroccan Personal Status Code) in 2004 which has allowed, in recent years, feminist movements to launch calls for gender parity. As a result of these calls, women are increasingly gaining access to higher positions as well as to the House of Representatives (by election);

2) the adoption, in May 2005, of the "National Initiative for Human Development" (INDH) which aims at reducing poverty, precariousness and social exclusion through actions of :

- a) support for income-generating activities (IGA);
- b) developing competency;
- c) improving access to basic services and infrastructure (education, health, roads, water and sanitation, environmental protection, etc.).

This initiative is based on a decentralized approach that calls on local actors to establish a dynamic in favor of human development that should be in perfect harmony with the Millennium Development Goals (MDGs), which later became the Sustainable Development Goals (SDGs);

3) the recent launching, in April 2021, of a very ambitious social protection project. This project includes :

- a) the generalization of the Compulsory Health Insurance (AMO which stands for Assurance Maladie Obligatoire) by the end of 2022 and the opening of the health sector to foreign skills and foreign investment, in order to face the increasing demand for medical care;
- b) the generalization of family allowances in favor of families who do not benefit from them by the end of 2024;
- c) the enlargement of the base of the members of the pension schemes by 2025;
- d) the generalization of the job loss indemnity by 2025.

On the political level, the major events that have marked the contemporary Moroccan history are the organization of the Green March in 1975 to recuperate Saharan provinces of the South from Spanish colonization, then the enthronement of the current King of Morocco, His Majesty King Mohamed VI, in July 1999, through the government of the Alternation, led for the first time by the Socialists between 1998 and 2002.

In addition, the "Moroccan Arab Spring", headed by the "20 February" Movement led to the adoption of a new Constitution in July 2011 and the organization of premature legislative elections which led, in 2012, to the constitution of a Government headed by an Islamist party, the Justice and Development Party (PJD which stands for Parti de la Justice et du Développement).

3. Review of the Literature on TFP

Economic growth is a phenomenon that is difficult to explain exhaustively, since an increase in production levels is not explained only by an increase in the levels of used inputs. This difference which is not explained by the

increase in inputs is due to what is commonly called total factor productivity (hereafter TFP).

As a result, TFP has always attracted the attention and curiosity of economists who have always recognized that the concept of TFP is not well defined and, in the absence of its own theory, TFP can be interpreted in different ways. However, these economists are almost unanimous on the fact that TFP remains an important element in the analysis of the economic growth process.

3.1 What Is the Purpose of the TFP?

Estimating TFP growth is a difficult task, but it is essential for assessing the country's economic performance. This performance reflects a more efficient use of inputs (World Bank, 2000).

As a result, the TFP growth rate is very interesting for intertemporal comparisons of productivity for a given country in different periods, but it is generally useless for comparing relative productivity across countries (Hulten, 2000).

3.2 How Have Economists Explained TFP?

An important way of assessing the contribution of a resource to the production of goods and services is its productivity. Thus, if the notion of productivity is very old and goes back to Adam Smith in 1776, the notion of TFP appeared in a work made by Tinbergen in 1942. This latter is considered to be the founder of the calculation of the growth of this indicator (Ciccone & Dimaria, 2006). Consequently, the concept of TFP is used to measure the productivity of all factors together.

As a result, TFP is not a simple productivity measure relating output to one factor, but a measure that captures everything that is neither labor nor capital productivity. This shift from single-factor productivity to total factor productivity shows that growth analysis is a very complex process.

Other definitions have been given to TFP such as 1) "TFP is defined as the efficient use of human and physical capital in the production process" (Biber, 2017) or 2) "TFP is the share of output not explained by the amounts of inputs used in production" and TFP growth is usually measured by the "Solow residual" (Comin, 2006). Thus, its level is determined by the search for the way inputs are used in production in an efficient and intensive way.

Also, Solow considers that this TFP represents a "manna from heaven" and/or it is the pure and simple expression of "our ignorance" of all the determinants of economic growth (Hulten, 2000).

Similarly, some economists consider TFP growth to be a residual concept since it measures our "ignorance" of how to explain an unjustified economic growth (Hulten, 2000). Others consider that improvements in the quality of work and technology are one of the elements that contribute to the increase in TFP. The latter is considered a key variable for achieving sustainable growth.

So, the TFP model produces an explanation of economic growth based only on the production function and marginal productivity conditions. As such, it is not a theory of economic growth because it does not explain how the variables of the production function evolve over time (Hulten, 2000).

Indeed, output does not depend only on inputs, since the existence of TFP reflects the presence of other elements affecting the production of this output.

This TFP is also called the Solow residual and is obtained from a relationship between the different variables of a production function of the Cobb-Douglas form.

Other economists give the example of the "Asian Miracle" which comes essentially from capital accumulation instead of TFP (Senhadji, 1999), others consider that the dynamics of growth can also be linked to elements that are independent of the production function and can be based essentially on technology, investment in human capital, R&D activities and innovation, technological change, institutional changes, a good governance, trade liberalization, a high private sector participation, the use of particular organizational structures, the introduction of new managerial techniques, returns to scale, political stability, ... etc. Thus, all these elements can be an important determinant of TFP growth and can play a key role in increasing TFP as shown in the literature on endogenous growth (Arora & Bhundia, 2003).

3.3 Formalization of the TFP

A first formalization of the TFP was given by the neoclassical theory of the production function, which states that the aggregate production function combining capital and labor factors is written as follows:

$$Y_t = A_t * f(K_t, L_t) \quad (1)$$

Where:

Y_t is aggregate output;

K_t is the capital factor;

L_t is labor input;

A measures the TFP, i.e. the efficient conversion of inputs into output.

This production function is assumed to have the following characteristics:

- constant returns to scale;
- positive and decreasing marginal products.

From this production function, the Solow residual, which represents a measure of TFP, is given by (Hornstein & Krusell, 1996):

$$A_t = \frac{Y_t}{f(K_t, L_t)} \quad (2)$$

If we take the case of a Cobb-Douglas production function linking output (Y) to inputs (physical capital K and labor input L) and with a return to scale γ , the production function presented above is written as follows (World Bank, 2000):

$$Y = A * (K^\alpha * L^{1-\alpha})^\gamma \quad (3)$$

with :

- Y : total output ;
- A : total factor productivity ;
- K : capital input ;
- L : labor input;
- α : capital-output elasticity (or the percentage contribution of capital growth to output growth). It measures the share of physical capital in output;
- $\beta = 1 - \alpha$: labor-output elasticity (or the percentage contribution of the increase in labor to the increase in output) ;
- γ measures the extent of returns to scale. Thus, if $\gamma = 1$ ($\gamma > 1$) ($\gamma < 1$), then returns to scale are constant (increasing) (decreasing).

Let's consider the case where $\gamma = 1$ in order to have a Cobb-Douglas production function with constant returns to scale:

$$Y_t = A_t * K_t^\alpha * L_t^{1-\alpha} \quad (4)$$

From the equation (4), the TFP is obtained as the Solow residual and it is given by:

$$A_t = \frac{Y_t}{K_t^\alpha * L_t^{1-\alpha}} \quad (5)$$

In terms of growth rates, the equation (4) gives us:

$$g_A = g_Y - [\alpha * g_K + (1 - \alpha) * g_L] \quad (6)$$

Thus, for the given values of the growth rates of Y , K , and L (g_Y , g_K , and g_L , respectively) and some information about the production function parameters (notably α), we can obtain estimates of TFP growth as the difference between observed actual output growth and a weighted average of input growth rates (Arora & Bhundia, 2003).

This production function approach explicitly gives output in terms of inputs and TFP, following a well-known procedure. For that purpose, a functional form is assumed to be known for the aggregate production function (a Cobb-Douglas function, for example) with constant shares over time for labor and capital (here, the parameter α).

As a result, for empirical work, we need information on the parameters of the production function to estimate productivity growth. Since these parameters are not directly observable, it is then very useful to make some assumptions. For example, for a constant return to scale of the production function ($\gamma = 1$), it is generally assumed to take values of α between 0.3 and 0.5 (World Bank, 2000).

3.4 Determining the Capital Stock

The capital stock series (K) is constructed from the following formula, known as the perpetual inventory method,

using the investment I (Nehru & Dhareshwar, 1994):

$$K_t = (1 - \delta) * K_{t-1} + I_t \quad (7)$$

Where the capital stock K of each period is measured by the stock of the previous period (net of depreciation) plus the flows of new investments, with :

K_t : capital stock at date t;

I_t : investment at date t;

δ : rate of capital depreciation.

This equation describes how the capital stock accumulates, from one period to another, in an economy.

In the stationary state, the rate of change of capital is equal to that of output g. Thus, we obtain the following equation (Nehru & Dhareshwar, 1993):

$$\frac{K_t - K_{t-1}}{K_{t-1}} = -\delta + \frac{I_t}{K_{t-1}} = g$$

Hence:

$$K_{t-1} = \frac{I_t}{g + \delta} \quad (8)$$

The construction of a statistical series related to the capital stock faces the problem of the initial value of K (denoted K_0). This problem can be solved in different ways such as estimating the base year capital stock (K_0) (Note 1) or the parameter δ .

3.5 Growth Accounting Equation and Determination of the Contribution of Inputs to Growth

In the economics literature, the technique of decomposing output growth according to the contributions of each factor of production is called growth accounting.

According to this technique, a part of the growth is due to capital and labor factors and the other part that is not explained by these two factors is due to technical progress or so-called TFP. This TFP is supposed to capture the impact of the non-tangible aspects of progress that allow capital and labor to increase their productivity.

In general, economists use the shares in national income (GDP) of labor and capital to measure their contributions to production. Thus, for a Cobb-Douglas production function with constant returns given by relation (4), we derive all the terms with respect to time and obtain what is known as the growth accounting equation, which is written as follows:

$$\underbrace{\frac{dY_t}{dt}}_{\text{Production growth rate}} = \underbrace{\frac{dA_t}{dt}}_{\text{TFP's contribution}} + \underbrace{\alpha * \frac{dK_t}{dt}}_{\text{Capital's contribution}} + \underbrace{(1 - \alpha) * \frac{dL_t}{dt}}_{\text{Labor's contribution}} \quad (9)$$

This equation shows how the change in output depends on changes in the employed quantity of labor and capital, and a set of effects unrelated to the change in factor quantities. By rearranging the members of the above equation, the change in TFP can be easily measured as follows:

$$\frac{dA_t}{dt} = \frac{dY_t}{Y_t} - \alpha * \frac{dK_t}{K_t} - (1 - \alpha) * \frac{dL_t}{L_t} \quad (10)$$

This change also represents the growth in output not explained by growth of inputs.

Another approach to growth accounting is to express GDP (or output) per worker as a function of capital per worker. This relationship is expressed as follows:

$$Y = A * K^\alpha * L^{1-\alpha}$$

Dividing both members of this equality by L gives:

$$\frac{Y}{L} = A * \left(\frac{K}{L}\right)^\alpha \quad (11)$$

Switching to the logarithm, equation (11) becomes:

$$\ln\left(\frac{Y}{L}\right) = \ln(A) + \alpha * \ln\left(\frac{K}{L}\right) \quad (12)$$

Given the problem of non-stationarity of the variables used (production, capital and labor), this equation (12)

will be expressed in terms of growth rate and we obtain :

$$\frac{d\left(\frac{Y}{L}\right)}{\left(\frac{Y}{L}\right)} = \frac{d(A)}{A} + \alpha * \frac{d\left(\frac{K}{L}\right)}{\left(\frac{K}{L}\right)} \quad (13)$$

This growth accounting is not a theory in itself and has no direct implications for economic policy to stimulate growth.

As far as Morocco is concerned, previous researches have studied growth accounting, either in the context of a group of countries (using panel data) or in the case of Morocco alone.

4. Processing and Sources of the Data Used

Unlike other research studies that have relied on very long statistical series from international databases such as the World Bank's World Development Indicators (WDI), in this study we have relied on statistical data produced by the Haut-Commissariat au Plan (HCP which stand for High-Commission for Planning in Morocco), even though these used series are not long and begin only since 1999. This constraint is due to the fact that National Employment Survey did not begin at the national level until 1999 since, prior to that date, this survey covered only the urban area.

As a result, the conceptual framework for this work suffered from some statistical data problems related to:

- the length of the series: indeed, the statistical series are not long and have started since 1999. This short series length did not allow us to divide the 1999-2019 period into sub-periods to compare the results obtained according to these sub-periods;
- the capital stock series depends on the initial capital stock (K_0), which also depends on other parameters, including the depreciation rate (δ) and the average annual growth rate (g). Thus, these two parameters have taken values in two different directions: the parameter δ is exogenous and is taken to be equal to 5% (a figure that corresponds to industrialized economies) and the parameter g that depends on the study period considered.

Below is a table of the statistical series of the three variables that were used in this work (Table 1). These series are:

- Production (Y): This is the total value added in real terms (chain-linked prices, base 2007);
- Capital stock (K): This is a series constructed using the perpetual inventory method (real terms, base 2007);
- Employment (L): This is the employed population (number of persons) from the National Employment Survey.

Table 1. Added value, capital stock and employment in Morocco 1999-2019

Years	Added value (in Mn MAD)	Capital stock (in Mn MAD)	Labor (in persons)
1999	401 699	1420990	9360321
2000	410 580	1470724	9323229
2001	440 138	1529308	9264609
2002	452 478	1591802	9414616
2003	482 697	1677069	9837579
2004	506 176	1773544	9933624
2005	523 323	1863556	9946503
2006	561 132	1963903	10212200
2007	576619	2085126	10297157
2008	614487	2250481	10380612
2009	634877	2400379	10454783
2010	664449	2538107	10404655
2011	706247	2695885	10509305
2012	725238	2842167	10510503
2013	753391	2998829	10624597
2014	766887	3140292	10645573
2015	789782	3278384	10678729
2016	790808	3435219	10641621
2017	825012	3610598	10698931
2018	849499	3808267	10810000
2019	872421	3990143	10975000

5. Empirical Results

It is important to note that the statistical data used in this article are obtained from the “Comptes de la Nation” of the Haut-Commissariat au Plan. All aggregates are in millions of dirhams, while the employed population is in numbers of individuals. The added value is used instead of output and all data are presented at constant prices for the period under study (1999-2019).

5.1 Calculation of the Capital Stock

In this work, the starting point of the capital stock series is calculated as follows:

$$K_{1999} = \frac{I_{2000}}{g + \delta}$$

With:

δ : depreciation rate ($\delta = 0,05$) (Note 2).

g : the average annual growth rate of production for the period 1999-2019 ($g = 3.8\%$).

5.2 Estimation of the Parameters of a Production Function of the Cobb-Douglas Form with Constant Returns to Scale

The aim of this paragraph is to estimate the parameter α of a production function of the Cobb-Douglas form with constant returns to scale and which has the following form:

$$Y = A * K^\alpha * L^{1-\alpha}$$

Estimating equation (13) by the ordinary least squares method gives :

$$\begin{cases} \ln\left(\frac{Y}{L}\right) = 0,01 + 0,45 * \ln\left(\frac{K}{L}\right) \\ R^2 = 0,12 \quad DW = 2,45 \end{cases}$$

Calculating A for each year (A_t) gives:

$$A_t = \frac{Y_t}{K_t^{0,45} * L_t^{0,55}} \quad (14)$$

This method differs from that used by Solow (Solow, 1957) which, once the growth rate of A was calculated, used the fact that :

$$A(t+1) = A(t) * \left[1 + \frac{\Delta A(t)}{A(t)}\right] \text{ to construct the time series of } A(t) \text{ by taking arbitrarily } A(1909) = 1.$$

Thus, by applying the relation (14), we obtain a series of A for the period from 2000 to 2019 whose mean is :

$$A = 0,12$$

Finally, we obtain:

$$Y = 0,12 * K^{0,45} * L^{0,55}$$

This result shows that the elasticity of GDP to capital is 45% while that to labor is 55%.

5.3 Calculation of the Contribution of Inputs to Growth

From the equation (10), we can obtain the contribution of TFP to growth and we get:

$$\frac{dA}{A} = \frac{dY}{Y} - \alpha * \frac{dK}{K} - (1 - \alpha) * \frac{dL}{L} = 1,11$$

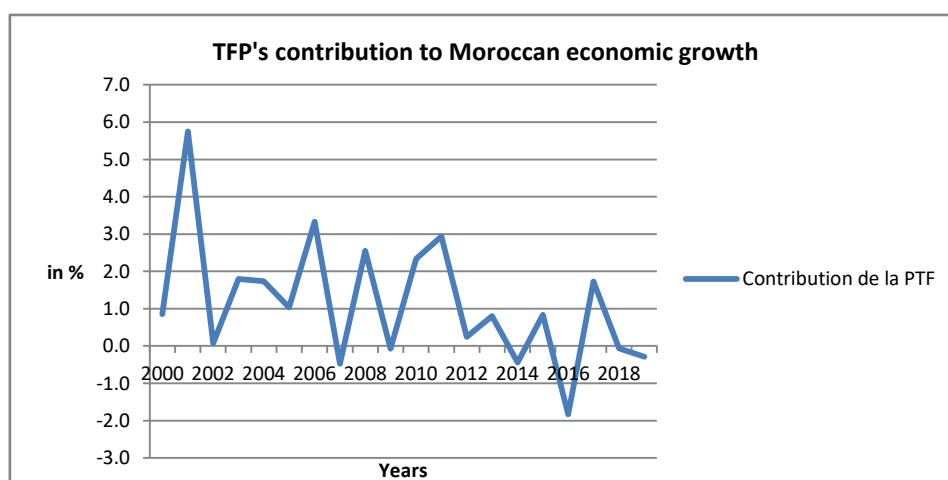
The results corresponding to the contribution of inputs to this economic growth are presented in the following table:

Table 2. Decomposition of economic growth and contribution of production factors ($\alpha = 0.45$)

Années	Growth (in %)			Value of A for $\alpha = 0,45$	Contribution (in %)		
	Output (Y)	Capital (K)	Labor (L)		Capital	Labor	TFP
1999				0,10			
2000	2,2	3,5	-0,4	0,10	1,6	-0,2	0,9
2001	7,2	4,0	-0,6	0,11	1,8	-0,3	5,8
2002	2,8	4,1	1,6	0,11	1,8	0,9	0,1
2003	6,7	5,4	4,5	0,11	2,4	2,5	1,8
2004	4,9	5,8	1,0	0,11	2,6	0,5	1,7
2005	3,4	5,1	0,1	0,11	2,3	0,1	1,0
2006	7,2	5,4	2,7	0,12	2,4	1,5	3,3
2007	2,8	6,2	0,8	0,11	2,8	0,5	-0,5
2008	6,6	7,9	0,8	0,12	3,6	0,4	2,6
2009	3,3	6,7	0,7	0,12	3,0	0,4	-0,1
2010	4,7	5,7	-0,5	0,12	2,6	-0,3	2,3
2011	6,3	6,2	1,0	0,12	2,8	0,6	2,9
2012	2,7	5,4	0,0	0,12	2,4	0,0	0,2
2013	3,9	5,5	1,1	0,13	2,5	0,6	0,8
2014	1,8	4,7	0,2	0,12	2,1	0,1	-0,4
2015	3,0	4,4	0,3	0,13	2,0	0,2	0,8
2016	0,1	4,8	-0,3	0,12	2,2	-0,2	-1,8
2017	4,3	5,1	0,5	0,13	2,3	0,3	1,7
2018	3,0	5,5	1,0	0,13	2,5	0,6	-0,1
2019	2,7	4,8	1,5	0,13	2,1	0,8	-0,3
Period 1999-2019	3,8	5,0	0,8	0,1	2,3	0,4	1,1

The analysis of the contribution to growth of the residual factor is important because it reflects everything related to the qualitative improvement of the productive environment within the economy. Thus, this improvement reflects the existence of several elements external to the inputs (capital and labor), notably rainfall, education of the workforce, governance, etc.

Thus, reading the above results reveals that, for the period 1999-2019, the average annual growth rate was around 3.8%. For this rate, the contribution of the capital factor was 2.3% and that of the labor factor was 0.4%. The difference, which is about 1.1%, is not explained by the inputs but by total factor productivity.



These figures differ from those obtained by other works previously carried out. Thus, the following table gives a synthesis of the results obtained by these different works:

Table 3. Summary of the results obtained by some other works on growth accounting

Study	Period of Analysis	Contribution to GDP growth (in %)		
		Capital	Labor	TFP
HCP (Note 3) (1992)	1960-1990	48,2	40,4	11,4
CMC (Note 4) (1997)	1960-1996	22,9	49	28,1
Makdissi et al. (Note 5) (2000)	1960-1997	51	26,5	22,5
Present Study	1999-2019	60,5	10,5	29

Source: (HAUT-COMMISSARIAT AU PLAN (MAROC), 2005); p. 59.

The results obtained differ from one study to another depending on the methodology adopted (individual country or among a country panel) and the period of analysis. Thus, according to the HCP (1992) and Makdissi et al (2000), capital accumulation contributes to growth with 48.2% and 51% respectively. For its part, the study conducted by the Centre Marocain de Conjoncture (CMC) shows that 49% of growth in Morocco is due to labor factor. As for TFP, it only contributes up to 28% to growth in the best cases.

6. Conclusion

The growth accounting exercise carried out for the value of $\alpha = 0.45$ obtained while using the ordinary least squares (OLS) regression carried out in this work shows that growth was essentially driven by capital, since its contribution was of the order of 60%, whereas that of the factor labor was only 10%. The contribution of TFP was around 29%. This means that, on average over this period, 29% of the economic growth achieved is not explained by the traditional factors of production (capital and labor) and is justified by elements other than these two factors, such as qualitative determinants of economic growth that were perfectly explored by the endogenous economic growth literature.

To conclude, we can say that, despite the fact that it is not based on a theory capable of explaining and justifying this unexplained part of growth, total factor productivity remains a tool that stipulates reflection on measures that can improve growth outside the factors of production.

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References

- Arora, V., & Bhundia, A. (2003). Potential Output and total Factor Productivity Growth in Post-Apartheid South Africa. *IMF Working Paper*, p. 21. <https://doi.org/10.2139/ssrn.880244>
- Biber, A.E. (2017). *Contribution of Total Factor Productivity in Economic Growth Rate*. Retrieved from https://www.researchgate.net/publication/323839942_Contribution_Of_Total_Factor_Productivity_in_Economic_Growth_Rate
- Ciccone, J., & Dimaria, C. R. (2006). *La productivité totale des facteurs au Luxembourg* (p. 92). Retrieved from <https://statistiques.public.lu/fr/publications/series/cahiers-economiques/2006/102-productivite-totale/index.html>
- Comin, D. (2006). Total Factor Productivity. *New York University and NBER*, 1-5. Retrieved from https://link.springer.com/chapter/10.1057/9780230280823_32
- Haut-Commissariat Au Plan (MAROC) (2005). *Les sources de la croissance économique au Maroc* (p. 82). Retrieved from <http://www.hcp.ma>
- Hornstein A. Et Krusell P. (1996). Can technology improvements cause productivity slowdowns? *NBER Macroeconomics Annual*, 11, 209-259. <https://doi.org/10.1086/654303>
- Hulten, C.R. (2000). Total Factor Productivity: A Short Biography. *National Bureau of Economic Research Working Paper*, n 7471. <https://doi.org/10.3386/w7471>
- Nehru, V., & Dhareshwar, A. (1993). A New Database on Physical Capital Stock: Sources, Methodology, and Results. *Revista de Análisis Económico – Economic Analysis Review*, 8(1), 37-59. Retrieved from <https://www.rae-ear.org/index.php/rae/article/view/202>

- Nehru, V., & Dhareshwar, A. (1994). New estimates of total factor productivity growth for developing and industrial countries. *World Bank Policy Research Working Paper, n°1313*, p. 36. Retrieved from <https://econpapers.repec.org/paper/wbkwbrwps/1313.htm>
- Senhadji, A. (1999). Sources of Economic Growth : An Extensive Growth Accounting Exercise. *IMF Working Papers, n°WP/99/77*, p. 41. <https://doi.org/10.2139/ssrn.880604>
- Solow, R.M. (1957). Technical change and the aggregate production function. *The Review of Economics and Statistics, 39*(3), 312-320. <https://doi.org/10.2307/1926047>
- World Bank. (2000). Measuring growth in total factor productivity. *Poverty Reduction and Economic Management Network (PREM) Notes, n°42, 1-4*. Retrieved from https://openknowledge.worldbank.org/bitstream/handle/10986/11423/multi_page.pdf?sequence=1&isAllowed=y

Sources of Statistical Data

Haut-Commissariat au Plan (Kingdom of Morocco; <http://www.hcp.ma>)

- 1) Comptes de la Nation (Various issues).
- 2) Enquête Nationale sur l'Emploi (Various issues).

Notes

Note 1. K_0 is determined in several ways, including equation (8). Another method is going back to a sufficiently distant year in the past and estimate the capital stock of that year as approximately one-third of the GDP of that year (Haut-Commissariat Au Plan (MAROC), 2005a, p. 24).

Note 2. This value is generally applied to the case of industrialized countries, whereas for developing countries it is assumed that δ is somewhat higher than this value because the structure of the economy is changing rapidly.

Note 3. HCP (1992): Les sources de croissance de l'économie marocaine (cité dans HCP (2005)).

Note 4. Centre Marocain de Conjoncture (1997): Bulletin semestriel du CMC (cit é dans HCP (2005)).

Note 5. Makkissi, Fattah, and Limam (2000). Determinants of growth in the MENA countries. *Global Research Project (GRP) Paper* (cit é dans HCP (2005)).

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