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RESEARCH AND STATISTICS BRANCH

STAFF WORKING PAPER 09/2007

Explaining productivity change in Morocco

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Explaining productivity change in Morocco

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December 2007

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna, 2008

Abstract

The first half of the paper estimates and analyses productivity change in Morocco. It begins with a Solow sources-of-growth analysis, which shows that total factor productivity (TFP) growth is a significant contributor to overall economic growth. We complement this analysis with a decomposition of TFP growth into change in technical efficiency and technical change. Results show that, during the past four decades, average annual change in technical efficiency has been positive and sufficient to outweigh the negative contribution of technical progress, thus, on balance, leading to positive TFP growth for the period as a whole. However, the role of TFP growth for overall growth has diminished over time, with Morocco having lost ground relative to the world technology frontier. The second half of the paper considers the roles of infrastructure and R&D investment, the financial system, educational and institutional quality, and policies pertaining to tariffs, exchange rate, public spending and wage setting for explaining productivity performance in Morocco.

*Keywords***:** Sources-of-growth analysis; TFP growth; change in technical efficiency; technical progress; determinants; and economic policy.

1. Introduction

Economic growth in Morocco has been volatile and, in the last 20 years, generally disappointing, periodically even lower than in several poor-performing countries in sub-Saharan Africa.[1] To achieve such targets as the Millennium Development Goals (MDGs), growth is crucial. It is, therefore, imperative for Moroccan policymakers to identify relevant sources of growth and, consequently, policy areas for renewed growth. This is the aim of this paper. Since productivity growth underpins sustained growth and welfare enhancement, such growth is the focus of this paper.

To this end, the paper first adopts a standard Solow sources-of-growth framework (Solow, 1957) to measure the roles of factor accumulation and total factor productivity (TFP) growth as sources of GDP growth. Secondly, using Data Envelopment Analysis (DEA) in a complementary fashion, TFP growth is decomposed into change in technical efficiency and technical change, providing a "sources-of-TFP growth" analysis (see, for example, Färe *et a*l., 1994) to identify further relevant policy areas.

Based on our preferred measure, GDP growth decomposition reveals that, from 1960 to 2000, TFP growth accounts for a respectable 20-30 per cent; the rest belongs to factor accumulation, which, consequently, appears as the dominating source of growth. The contribution of TFP to overall growth diminishes over time and even turns negative in the last decade considered. Decomposition of TFP growth into technical progress and change in technical efficiency suggests that the latter, over the entire time period, is the major source. This is not surprising, as developing countries overwhelmingly rely on technology adoption for TFP growth. In the last 10-year period, however, technical change took over as the dominating source of TFP growth, with Morocco moving further away from the world technology frontier.

Several studies measuring sources of growth in Morocco predate this paper (for example, Bouhia, 2000; Dasgupta *et al*., 2002; Gray, 1990; Sekkat, 2004; Senhadji, 2000; and Zaimi, 2002). Those analyses are extended by, first, adding analysis of TFP growth and its decomposition and, secondly, by addressing such qualitative factors as institutional factors and policies that might help explain past productivity performance.

In particular, analyzing the main determinants of recent declines in productivity performance is a first step towards identifying what needs to be done to achieve sustained productivity performance and overall growth. Among determinants, infrastructure and the

[1] The time period referred to is 1960 to 2000.

financial and educational systems are discussed. Important policy areas, such as those related to trade, labour, public spending and the exchange rate, which may explain productivity performance, are also considered.

2. Methodology and data

This paper employs two measurements methods to compute TFP growth: the standard Solow sources-of-growth and Data Envelopment Analysis (DEA), where the latter is based on the output-distance function and the Malmquist index (Malmquist, 1953).[2,3] In using the output-oriented version of DEA, the paper follows the approach of Färe *et al.* (1994).

In growth accounting, the growth of factors (capital and labour) is subtracted from the growth of output. What remains is growth pertaining to TFP. While this method is free from many disturbing assumptions related to parametric methods (e.g., the error distribution in stochastic frontier analysis), some assumptions are needed to make it operational. In particular, perfect competition is a prerequisite to assuming that the income shares equal the marginal product of capital and labour. Because of the difficulty in obtaining the actual shares, it is conventionally assumed that capital's is one-third while that of labour is two-thirds.[4] Equation (1), in logs, illustrates the idea of growth accounting,

$$\Delta TFP = \Delta y - \alpha \Delta k - (1-\alpha)\Delta l, \qquad (1)$$

where Δ denotes a discrete approximation to continuous change, α is the capital's share set to one-third and constant returns to scale is assumed.

An alternative, less restrictive approach is DEA, which is based on Farrell (1957) and on extensions of his work by Charnes *et al* (1978), as well as related work by Färe *et al.* (1983, 1985) and Banker *et al.* (1984). In this approach, efficiency of a production unit (in this case, a country) is measured relative to the efficiency of a number of so-called peer production units (conditional on capital intensity) and subject to the restriction that all units are on or below the best-practice frontier. Although fewer behavioural restrictions are needed in this case, a common criticism relates to its relative inability to handle satisfactorily noisy

[2] Isaksson (2006) provides a thorough discussion on measuring TFP, while Hulten and Isaksson (2007a) empirically illustrates how changing underlying assumptions impacts on the inferences.
[3] See also Caves *et al.* (1982), Nishimizu and Page (1982) and Färe *et al.* (1994). Coelli *et al.* (1998) and Charnes *et al.* (1997) provide excellent introductions to the Malmquist TFP index.
[4] This convention goes back to the findings of Cobb and Douglas (1928) for US manufacturing.

data (e.g., mismeasurement and outliers). Growth accounting and DEA could, therefore, be seen as complementary. However, because the implied measured shares in DEA are likely to differ from those assumed for the case of growth accounting, the two measurement methods might produce different TFP results. Furthermore, for the same reasons the sources of growth decomposition may differ as well. In that case, it is not advisable to apply the DEA TFP growth figures in the Solow decomposition.

Let a country be denoted by c with $c=1,\ldots,C$, where C amounts to the number of observations in the sample. Assume that at every point in time a production technology exists, which transforms $k=1,\ldots,K$ inputs x_k into $m=1,\ldots,M$ outputs y_m. The linear programming problem for a production point of a specific country c observed in period s with reference to the frontier function of period t is

$$\begin{aligned} &\max_{\Phi,\lambda} \ \Phi_c \\ &s.t.\ \Phi_c\, y^s_{mc} - \sum_{i=1}^{C} \lambda_i\, y^t_{mi} \le 0 \qquad \forall\, m = 1,\ldots,\ M \\ &\qquad\qquad \Rightarrow\ D^t_c(x^s, y^s) = \Phi_c^{-1} \qquad (2) \\ &\sum_{i=1}^{C} \lambda_i\, x^t_{ki} \le x^s_{kc} \quad \forall\, k = 1,\ldots,\ K \\ &\lambda_{1,\ldots,}\ \lambda_C \ge 0. \end{aligned}$$

The percentage change of all outputs in period s required to attain the frontier function in period t (based on constant input levels) is represented by the maximum proportional augmentation factor Φ_c. Assuming that $s = t$, the country is on the frontier if $\Phi_c = 1$. On the other hand, if $\Phi_c > 1$, Φ_c measures the percentage level to which country c must increase its output to reach the frontier. The real number $\lambda_i \ge 0$ corresponds to a virtual country on the frontier with which c is compared. For all $\lambda_i > 0$, this number indicates if and to what extent observation i $(i=1,\ldots,n)$ enters into construction of the point of comparison for observation c. By way of calculation over all C observations, the productivity difference between the observations and the world-technology frontier for period $s = t$ is obtained.

Frontier functions and technical-efficiency measures can be compared across time by means of the Malmquist index (Malmquist, 1953). In turn, the Malmquist index can be decomposed into two parts: change in technical efficiency and technical change. The latter component represents the movement of the world-technology frontier itself. The technical-efficiency component of the Malmquist index can be thought of as catching-up or

convergence, i.e., over time, countries move relative to the frontier. If a country moves closer to the frontier, it is said to have caught up with, or converged to, best-practice countries. If a country moves away from the frontier, it is interpreted as diverging from better performing countries. If the frontier moves outward, the interpretation is that of technical progress or innovation, since the world's most advanced countries are part of the sample. However, if the frontier moves inward, this would be interpreted as negative technical progress, the implausibility of which was discussed by Forstner and Isaksson (2002).

The (output-oriented) Malmquist TFP change between period *s* and period *t* can be written as

$$m_o(y_s, x_s, y_t, x_t) = \left[\frac{d_o^s(y_t, x_t)}{d_o^s(y_s, x_s)} \times \frac{d_o^t(y_t, x_t)}{d_o^t(y_s, x_s)} \right]^{1/2} \tag{3}$$

where $d_0^s(y_t, x_t)$ denotes the distance of the observation of period *t* from the technology frontier of period *s*. Now, equation (3) can be re-written as follows:

$$m_o(y_s, x_s, y_t, x_t) = \frac{d_o^t(y_t, x_t)}{d_o^s(y_s, x_s)} \left[\frac{d_o^s(y_t, x_t)}{d_o^t(y_s, x_s)} \times \frac{d_o^s(y_s, x_s)}{d_o^t(y_s, x_s)} \right]^{1/2} \tag{4}$$

where the ratio outside the brackets is the change in the output-oriented measure of (Farrell) technical efficiency between periods *s* and *t*. The expression within the brackets of equation (4) is a measure of technical change. More precisely, it is the geometric mean of the shifts of the technology frontier between *s* and *t*, evaluated at x_t and at x_s, respectively. If m_o is greater than one, TFP change from period *s* to period *t* has been positive. An m_o value of less than one indicates TFP decline. Empirically, all four distances measures of equation (4) need to be calculated.[5]

[5] A constant-returns-to-scale (CRS) technology needs to be assumed to measure properly TFP change by use of the Malmquist index (Grifell-Tatje and Lovell, 1995). When applying the Malmquist index at country level, the assumption of CRS seems to be appropriate, while in the case of, for example, plants such an assumption could be more problematic.

3. Results

3.1. Sources of growth

Table 1 shows that GDP grew at an average of 5.1 per cent annually during the period 1960-2000, while per capita GDP only grew by 1.9 per cent. However, GDP growth during this period was quite unstable, with fluctuations largely coming from the agricultural sector.

The evolution of GDP growth in Morocco may be divided into three periods of economic growth: (a) The first, from 1960 to the early 1980s, is characterized by very rapid growth (seven per cent annually on average) with fairly moderate fluctuations, measured by standard deviations from the mean (in percentages); (b) the second, between the beginning of the 1980s and early 1990s is characterized by greater fluctuations in growth rates; and, finally, (c) the third, from the 1990s onwards, is the period where growth falls significantly, growth rates are negative on average and fluctuations are large.

Table 1. Trends in real growth of GDP, agriculture and manufacturing, 1960-2000, (per cent)

Average annual growth rate	1960-2000	1960-1981	1981-1990	1991-2000
GDP	5.15 (5.79)	7.04 (5.09)	4.04 (4.85)	2.47 (7.06)
Agriculture	1.60 (25.85)	3.05 (12.46)	8.17 (23.69)	-4.85 (41.43)
Manufacturing	4.44 (2.78)	5.88 (2.3)	4.34 (3.42)	2.7 (1.38)

Source: GDP and sectoral value added (agriculture and manufacturing) are derived from Penn World Tables 6.1. (Heston, Summers and Aten, 2002) and the World Development Indicators (World Bank, 2006), respectively. Standard deviations are in parentheses.

GDP growth during the 1960s was among the highest in the world. Fuelled by revenues from worker remittances, and external financing flows, the country began a two-decade period of massive public investment in infrastructure, health and education, which in this early period of development, was able to translate into high growth. In addition to high levels of factor accumulation, TFP growth over the 1960s was high as well (see Table 2). However, in the 1980s, investment declined dramatically despite heavy external assistance and low oil prices. This was coupled with eroding macroeconomic balances and a growing debt burden. As a result, the annual average growth rate declined to four per cent. Due to recurring droughts and slow private sector response in the 1990s, GDP growth slowed further. Income volatility, measured in terms of standard deviations, has its source in agriculture and not manufacturing. Further transformation into manufacturing, therefore, appears as an interesting option for reducing volatility.

Table 2a. Percentage contribution to GDP growth (α=0.36)

	AAGR of			Contribution of		
	GDP	Capital	Labour	Capital	Labour	TFP
1960-2000	5.14	5.67	2.52	39.7	31.3	29.0
1960-1980	7.04	8.02	2.51	41.0	22.8	36.1
1981-1990	4.04	3.86	2.58	34.4	40.9	24.7
1991-2000	2.47	2.80	2.47	40.7	63.9	-4.7

Source: Authors' own calculations using capital's share equal to 0.36. Labour and investment data are derived from the Penn World Tables version 6.1. (Heston, Summers and Aten, 2002).
Note: AAGR: average annual growth rate

Table 2b. Percentage contribution to GDP growth (α=0.67)

	AAGR of			Contribution of		
	GDP	Capital	Labour	Capital	Labour	TFP
1960-2000	5.14	5.67	2.52	73.9	16.1	10.0
1960-1980	7.04	8.02	2.51	76.3	11.8	11.9
1981-1990	4.04	3.86	2.58	64.1	21.1	14.8
1991-2000	2.47	2.80	2.47	75.8	33.0	-8.8

Source: Authors' own calculations using capital's share equal to 0.67. Labour and investment data are derived from the Penn World Tables version 6.1. (Heston, Summers and Aten, 2002).
Note: AAGR: average annual growth rate

Tables 2a and 2b show the results of the growth accounting exercise, where GDP growth is decomposed into three components: the respective contribution of capital, labour and TFP. As indicated above, the latter is computed as the residual of GDP growth once capital and labour contributions have been taken into account. In order to estimate the contribution of each of the three sources of GDP growth, the estimation of capital's and labour's share in national income are needed. This paper uses two sources for the income shares. The first emanates from Senhadji (2000), who estimates capital's share to be 0.36—and, with the assumption of constant returns to scale, labour's share is consequently 0.64—which is very close to the standard assumption of one-third often encountered in the literature.[6] The second uses data from the *United Nations Statistical Yearbook*, which

[6] Senhadji (2000) relaxed the assumption of identical technologies across countries by estimating separate production functions for 88 countries, including Morocco. By using the traditional constant return to scale Cobb-Douglas production function in per capita form, he found significant differences across countries, with the long-term coefficient for Morocco found to be below the average for different regions.

suggests two-thirds for the capital's share.[7] This figure is inconsistent with the former but consistent with the view that the rate of return to capital in developing countries is higher than that observed in, for example, industrialized ones.

The capital stock computation is fairly standard. It is based on the perpetual inventory method with a depreciation rate of six per cent and an initial capital stock based on 10 years of investment (see Isaksson, 2006). Labour input is measured as total labour force.

The Tables indicate that capital grew much faster than labour during the entire period. However, while labour growth was nearly constant over time, capital growth was fastest in the first half of the sample period. Thereafter, capital growth slowed remarkably, implying decreasing capital per worker. This may be the proximate reason for the decline in GDP growth. However, since both capital and GDP declined over time, capital's contribution remained nearly constant. By contrast, labour's contribution to GDP growth sharply increased. Such development, amounting to more than 100 per cent, is only possible if the third contributor—TFP growth—turns negative, and this is the case. With a standard assumption of one-third for capital's share, TFP growth, on average, is a significant source of GDP growth.

The effect of applying the "measured" income shares (α=0.67) is mainly to inflate the role of capital accumulation at the expense of labour and TFP growth (see Table 2b). However, this has in principle a growth-level effect only. For example, instead of capital accumulation hovering at some 40 per cent, it is now doing so at some 75 per cent. Nonetheless, the trend contributions of capital and labour, respectively, remain similar to that revealed by Table 2a, i.e., labour contributes increasingly to output growth. The contribution of TFP growth during the entire period is now reduced to 10 per cent. Contrary to the trend in Table 2a, the middle period shows an increase in the role of TFP growth, before turning negative in the last sub-period considered. Table 2b shows the importance of getting the income shares right. But based on the estimations of Senhadji (2000) and the arguments made in Gollin (2002) and Hulten and Isaksson (2007), Table 2a is more reliable.

These results are almost identical to those obtained by Sekkat (2004) and Senhadji (2000), who established nearly the same tendencies in the trends of the contribution of the three sources of economic growth. Furthermore, the study conducted by Gray (1990) revealed a dramatic decrease in TFP growth, from 1.8 per cent annually during 1961-1968 to

[7] Isaksson (2006) discusses some of the shortcomings of these data provided by the United Nations. For example, self-employment is not appropriately accounted for, which leads to understated (overstated) labour (capital) shares.

1.4 per cent during 1968-1976 and to only 0.4 per cent during 1976-1987. Bouhia (2000), on the other hand, found a slight decrease in the contribution of labour and a substantial decline in the contribution of capital and TFP. In the study, TFP growth fell from an annual average of 0.7 per cent during 1960-1975 to zero during 1991-1998.

3.2. Labour productivity growth, capital deepening and TFP growth

Analysing the role of overall productivity as a major source of output expansion is a key element of any analysis focusing on sources of economic growth. Table 3 presents data on labour productivity growth, capital deepening and two measures of TFP growth. The first set of TFP figures is the same as before, i.e., those based on growth accounting, whereas the second set emanates from DEA. As can be seen, growth accounting tends to produce better productivity performance, which must be borne in mind in the decomposition of TFP growth presented below. While TFP increases at an average annual rate of 1.49 per cent (1.00 per cent based on DEA) over the period of analysis, at 2.54 (1.85) per cent it is only in the first sub-period that it is really strong. Thereafter, it falls to 1.00 (0.49) per cent in the second period and continues to negative levels during the last period. The decline in the average annual TFP growth during the three periods has led to a decline in the contribution of TFP to growth in labour productivity.

Table 3 reproduces the other growth indicators, albeit in their intense form. The decrease in average annual capital accumulation is a competing explanatory factor for the decline in labour productivity observed during the last four decades.[8]

Table 3. Growth of labour productivity, capital intensity and TFP (per cent)

	1960-2000	1960-1980	1981-1990	1991-2000
Labour productivity	2.57	4.43	1.42	0.00
Capital intensity	3.08	5.37	1.25	0.32
Total Factor Productivity- GA	1.49	2.54	1.00	-0.12
Total Factor Productivity- DEA	1.00	1.85	0.49	-0.19

Source: Author's calculations using Penn World Tables 6.1. (Heston, Summers and Aten, 2002).
Note: GA and DEA, respectively, stand for growth accounting and data envelopment analysis.

[8] Isaksson et al (2005) discuss the productivity performance of Morocco and the Middle East and North Africa (MENA), on the one hand, and the MENA region vis-à-vis the World Technology Frontier on the other.

3.3. Technical change and change in technical efficiency

With the caveat that TFP growth from growth accounting and DEA differ quite substantially, the sources of TFP growth are, nevertheless, examined more closely. On the assumption of constant returns to scale, TFP growth can be decomposed into technical change and change in technical efficiency and their relative contributions to overall TFP growth be assessed. However, if the contributions are very different, the analysis that follows is best considered with caution.

The distinction between technical efficiency change and technical progress offers an additional crucial dimension to the policy relevance of TFP studies. While change in technical efficiency, popularly called the catching-up term, measures whether the gap between best-practice and a country's realized production is diminishing or widening over time, technical progress measures the movement of the production or technology frontier over time. The former is a gauge of how rapidly new technologies are acquired and adapted to local conditions. The latter reflects the success of explicit policies to facilitate acquisition of foreign technology and may be interpreted as providing a measure of the rate of innovation (Gaofeng *et al*., 2001). Gains in technical efficiency change may be substantial and outweigh those from technical progress.

Table 4. Technical change, technical efficiency change and TFP growth, 1960-2000
(in per cent)

	1960-2000	1960-1980	1981-1990	1991-2000
Change in technical efficiency	1.45	3.00	1.82	-2.01
Technical change	-0.39	-1.09	-1.26	1.88
TFP growth	1.00	1.85	0.49	-0.19

Source: Authors' calculations using Penn World Tables 6.1 (Heston, Summers and Aten, 2002).

Table 4 presents estimates of change in technical efficiency, technical change and TFP growth during different phases of economic growth. During the period as a whole, the average annual change in technical efficiency was positive, outweighing the negative contribution of technical progress, on balance, leading to positive TFP growth for the period as a whole. The implication is that of catching-up with the technology frontier during negative technical progress. As can be expected from previous analysis, there are important intertemporal changes as well. In the first and second period, technical efficiency change was positive but with a slowing catch-up rate. Although technical change was negative, again, on

balance, TFP growth was positive. In particular, the 1960-1980 period was characterized by strong TFP growth and rapid catching-up.

As has already been seen, this was also the period when TFP contributed the most to GDP growth. It was only in the last period that the respective roles of technical change and change in technical efficiency reverse. In the past decade, Morocco lost considerable ground relative to the world technology frontier. Technical change was unable to make up for this loss and TFP growth, therefore, turned negative. The reversing roles of technical progress and change in technical efficiency may be the result of recent investments in, for example, R&D that will pay off later. This would be consistent with the notion that optimal utilisation of any newly implemented technology takes time and that efficiency temporarily deteriorates (Helpman and Rangel, 1999).

4. Major factors explaining the Moroccan productivity experience

Recent empirical productivity literature suggests a wide range of factors, including policies, which might have affected productivity performance. Instead of undertaking a formal econometric analysis, a qualitative analysis is presented based on acquired knowledge. In so doing, the areas discussed include human capital, institutional quality, investment in infrastructure and R&D, the financial system, policies related to the labour market and international integration, as well as public spending.

4.1. Mismatch between the education and training system and needs of industry

Generally, improvement of the workforce leads to stronger economic growth and enhanced productivity, as well as increased employment opportunities. New workers joining the workforce bring with them new skills that support entrepreneurship. Mankiw *et al*. (1992) present evidence that variations in human capital are an important determinant of cross-country differences in income per capita. There is also evidence to suggest that the very high rates of growth in some East Asian countries can, to a large extent, be attributed to human capital accumulation (Lucas, 1993). Otto (1997) argues that individuals can acquire human capital by two basic means: formal schooling and on-the-job training. While both are likely to be important, the latter, which is difficult to measure, appears to provide the more likely explanation for consistently high rates of growth in productivity.

Otto's basic premise is that, as individuals produce goods, they tend to think of ways of improving the production process. Hence productivity may rise without any observed change in human capital. With learning-by-doing, knowledge accumulates, as a by-product of

economic activity rather than as a deliberate effort. If learning by doing is an empirically important phenomenon, then the rate of productivity growth depends on the amount of new knowledge generated by conventional activities.

Despite doubling in primary school enrolment in Morocco since the 1960s, the educational level is far behind that of countries with similar income levels. For example, the illiteracy rate is one of the highest in the Arab world, at nearly 50 per cent for adults compared to 27 per cent in Tunisia; among the youth (ages 15-24), the illiteracy rate was 30 per cent in 2002, compared to less than six per cent in Tunisia. The poor quality of education renders many graduates ill equipped with modern skills. The combination of enrolment explosions, inadequately trained teachers, and lack of educational materials have seriously weakened the educational system.

However, what determines the amount of learning-by-doing in a particular industry or economy is an unresolved question. Lucas (1993) argues that if learning-by-doing is subject to diminishing returns to scale, a sustained rise in the growth rate of productivity will require continued introduction of new goods, rather than just continued learning on a given set of goods. Exporting is a measure by which a small economy can expand the range of goods that it can produce. This implies that openness seems to be an important precondition for learning-based growth. Professional training is an indirect way to achieve learning-by-doing effects. The problem is that the professional training system, which has been in place for only two decades, is largely designed to meet the needs of an economy based on low-wage enterprises providing agricultural products and assembled manufactured goods with limited local value-added. In short, it is not well suited to support productivity growth.

4.2. Institutional quality[9]

The literature on growth and productivity has focussed increasingly on the role of institutions. Institutional factors, such as the degree of regulation and security of property rights, have become increasingly recognized as factors that either hasten or hinder sustained economic growth (Rodrik *et al.*, 2002). In this context, an important dimension of a good investment climate is a governance system that allows contracts and property rights to be respected and corruption to be reduced.

[9] According to North (1990), institutions are defined as the formal and informal constraints on political, economic, and social interactions. From this perspective, good institutions are viewed as establishing an incentive structure that reduces uncertainty and promotes efficiency, hence contributing to stronger economic performance.

Surveys of existing enterprises and potential investors consistently rank various elements of institutional quality as among the major factors determining the attractiveness of developing economies for new private investment (Dasgupta *et al.*, 2002). Along this line, the work of Gwartney *et al.* (2004) shows that the investment rate and productivity of investment increase with the quality of institutions. Institutions also affect performance by fostering better policy choices. For example, weak institutions may foster bad policies and undercut the resilience of economies to exogenous shocks, leading to relatively volatile, crisis-prone economies. On the other hand, good governance is fostered through regulatory institutions that promote competition and support efficient resource allocation. These regulatory institutions have to be allowed to operate without harassment and corruption. This is supported empirically by e.g., Rodrik *et al*. (2002), who demonstrate the robust effect of institutions on volatility, with the higher the quality of institutions, the lower the volatility of growth.

In Morocco, the quality of institutions is among the factors behind the decline in growth and productivity because of the state's omnipresence in the economy, which has led to lack of, as well as unfair, competition. Since private investment, including that coming from abroad, tends to be channelled to countries with high returns, an examination of the transparency of investment procedures and regulations, degree of political risk and accountability of economic regimes and institutions represent a way to assess the quality of institutions. The Index of Economic Freedom, published annually by the Heritage Foundation (2003), constitutes an attempt to understand the relationship between economic freedom and growth.[10]

Its estimations indicate that, among Arab countries, Morocco carries the highest overall economic risk, along with Egypt, Yemen and Syria. Of all the index components, only monetary policy seems to be sound. More specifically, many surveys conducted in Morocco show that private sector development continues to be hampered by a number of institutional constraints, which weigh heavily on the costs of factors of production, in particular and on the investment climate, in general. Upgrading of the administration, tax and judicial systems, as well as streamlining of procedures, especially as concerns the creation of enterprises, are incomplete. Economic actors are frequently uncertain about which regulations that apply to their activities.

[10] Encompassing many measures of governance, the overall country index is composed of 10 elements: trade, fiscal burden, government intervention, monetary policy, foreign investment, banking/finance, wages/prices, property rights, regulation, and black market.

4.3. Investment in infrastructure

Equally important for productivity improvement is the quality of infrastructure, since good infrastructure is needed for private entrepreneurs to operate effectively. While the quantitative effect of infrastructure on productivity is still debated, recent work by De la Fuente (2002) suggests that there are sufficient indications that public infrastructure investment contributes significantly to productivity growth, at least in countries where a saturation point has yet to be reached. The returns to such investment are probably high when infrastructure is scarce and basic networks have not been completed but, afterwards, fall sharply. Hence, appropriate infrastructure provision is probably a basic ingredient to any successful development policy.

Infrastructure in Morocco is still characterized by public ownership, monopolies and stifling regulations. The situation is particularly difficult in Morocco because it needs to expand as well as maintain and replace existing infrastructure to cope with the requirements for faster economic growth. During the past two decades, inadequate infrastructure has paralyzed economic activities due to traffic bottlenecks, port congestion, breakdowns of overloaded electricity networks and long transit times. Because of constraints on public finance, over the last few years, the transport infrastructure has lacked adequate resources for its rehabilitation and maintenance. Poor infrastructure quality has, thus, impaired the competitiveness of industry.

This view is corroborated by the World Bank (1997), which argues the urgency of providing Moroccan producers with infrastructure services to become or remain competitive at international level. While massive public investment in infrastructure during the past four decades has been made, the country still suffers from lack of appropriate infrastructure services. This may explain the low level of economic diversification and poor productivity performance of the past two decades.

4.4. Investment in R&D and lack of innovation

Innovation-driven technical progress is the engine of economic growth in industrialized countries. A developing country can further economic growth by imitating more advanced economies. An analysis of Morocco’s position in terms of technical development and management suggests that it is, as yet, unable to develop its own activities in R&D sufficiently to generate growth. To compensate, the country turns almost exclusively to foreign technologies. Rather than creating new technology, its R&D system complements and supports technologies obtained through transfer or imports of capital goods. The

adoption of foreign technologies requires a cadre of skilled workers able to adapt these technologies to the characteristics of the national economy and, then, to improve industrial competitiveness through improvement of productivity.

In Morocco, both investment policy in technical development (low share of public expenditures devoted to R&D)[11] and the quality of services delivered by R&D-related institutions remain weakly adapted to the real needs of economic development and accelerated productivity growth. The R&D sector suffers from numerous deficiencies, attributable, mainly, to the lack of a clearly defined research policy, lack of funds and structures to guide, plan, coordinate, evaluate and promote research. Furthermore, the involvement of the private sector in R&D investment has been low by world standards (UNESCO, 1998) For example, in 1998, only some 10 per cent of total R&D expenditure emanated from the business sector. In most developed countries, business sector R&D spending exceeds that of the public sector. This has been attributed to a number of factors, ranging from the role of protection from reducing competitive pressures on domestic industry through inadequate managerial skills and exchange of information between researchers and industry to lack of venture capital to fund innovative ideas and companies.

4.5. Inefficient financial system

The financial sector is important for productivity growth. A well-functioning one operating at arms-length from political and corporate interests is crucial for competition and productivity growth. A large body of literature on financial intermediation shows the crucial role played by the financial sector in improving the economy's savings, investment, productivity, and growth (Jbili *et al*., 1997).

Until the early 1980s, Morocco pursued an inward-looking development strategy emphasizing the role of the state in economic activity to accelerate economic development and ensuring government control of strategic sectors. The strategy resulted in a large public sector. Financial resources were allocated to achieve planning objectives, with the balance allocated to the private sector at high interest rates. In addition, inefficiencies of direct government controls on credit allocation contributed to the build-up of non-performing loans, mainly in the case of development banks, in the banking sector. This weak financial system, which remained until the early 1980s, failed to direct private sector investment into activities

[11] According to UNESCO, in 1998, Morocco's gross expenditure on R&D was estimated at $50 million, which represents 0.14 per cent of GDP. Compared with the corresponding world average, which is some 1.4 per cent, it only represents a tenth (c.f. *www.unesco.org*).

in which the country had a comparative advantage. This, in turn, has affected economic growth at large and, in particular, that of productivity.

When faced with increasing economic difficulties in the mid-1980s and influenced by the worldwide trend towards financial liberalization and deregulation, Morocco embarked on a wide-ranging structural reform programme that included liberalization of its financial system.[12] The objectives behind the financial sector reform were to reduce direct government intervention and strengthen the role of market forces in allocation of financial resources, improve capacity of financial institutions to mobilize domestic savings and promote competition among banks. Although the liberalization of the banking sector, coupled with expansionary monetary policy, has led to substantially lower interest rates, this has yet to manifest itself in increased capital deepening.

4.6. Trade, foreign investment and exchange rate policy

This paper argues that productivity performance is influenced by its economic relationship with the rest of the world, through technical transfers, trade flows and investment. Theoretical studies argue that trade generates both static and dynamic gains in growth and productivity and that re-allocation of workers and capital towards industries with higher productivity levels may be particularly important. Although tariff cuts on capital and consumer goods lead to a decrease in investment cost, they force firms to become more efficient because of stiffer competition. This implies that domestic firms that are unable to adjust to such competition will have to exit the market. So far, empirical works have not succeeded in confirming a systematic link between trade openness and productivity growth (Dessus and Suwa, 2000).

By evaluating the degree of openness as well as changes in tariffs and protection levels, trade policy can be assessed. Table 6 shows that the degree of openness, measured by total trade in GDP, increased slowly between the period of 1993-1995 and in 2002. The main reason is that trade liberalization was concentrated only on capital goods. For other products, tariffs rates still remain high and their reduction has just started. In fact, Moroccan tariff rates are considered among the highest in the world. In 2002, non-discriminatory tariffs reached an average of 31.6 per cent, compared with an average rate of 12.8 per cent for middle-income countries. Moreover, these tariffs have increased since the 1990s as result of fixing Most

[12] The financial reform, *inter alia*, entailed abolishment of credit controls in 1991 and liberalization of interest rates on overdrafts, in 1992 and lending rates in 1996, while relaxed monetary policy implied reduction of Central Bank intervention on the money market and reduced reserve requirements.

Favoured Nations (MFN) tariffs at high rates under Morocco's commitments to the World Trade Organization (WTO). In other countries, they were reduced by more than 40 per cent on average. Non-discriminatory tariffs applied on manufactured imports are also among the highest in the world, reaching more than twice the average rates in other middle-income countries (Chemingui and Lahouel, 2004). It seems that under these conditions, in particular, for purposes of improving productive capacity, it is difficult for Moroccan firms to compete internationally.

Table 6. Degree of openness of Moroccan economy and other countries (1993-2002)
(Exports and imports of goods and services/GDP, in per cent)

Country	1993-95	Recent 3 Years
Egypt	52.9	32.7
Jordan	125.2	107.8
Morocco	54.7	57.0
Tunisia	71.2	77.6
Turkey	39.7	60.0

Source: Chemingui and Lahouel (2004) and author's calculations; recent three years available for respective countries: Egypt (2000-2002), Jordan (1998-2000), Morocco (1999-2001), Tunisia (2002-2004) and Turkey (2000-2002).

Morocco has made progress both at the bilateral and the multilateral level.[13] While it may be too early to evaluate the effect of these agreements, a preliminary assessment shows that FDI inflows have not increased. In fact, apart from privatization and franchises, FDI remains modest in Morocco and bureaucratic procedures, lack of legal security and political and social uncertainty are cited as the main obstacles to its development (Table 7).

Finally, the appreciation of the real exchange rate, by more than 20 per cent between 1990 and 2000 (IMF, 2001), has severely hurt competitiveness. The problem has been especially critical for the textiles sector, whose exports registered a net decline compared to other competing countries (e.g., Tunisia and Turkey) in the region. The reason for the appreciation seems to be that the Government pegged the Dirham to a currency basket in

[13] The most important Free Trade Agreement (FTA) is signed with the European Union (EU) in 2000. This agreement has introduced a progressive lowering of Morocco tariffs on industrial imports from EU. Complete liberalization of Moroccan industrial imports should be achieved by 2012. Morocco also signed an FTA with the United States, in March 2004 and with three Arab countries (Egypt, Jordan and Tunisia), in February 2004, with Turkey, in April 2004 and with the European Free Trade Association (EFTA), in June 1997, which entered into force in June 1999. At the multilateral level, Morocco is a member of WTO.

1993. In April 2001, the Central Bank changed the composition of the basket to increase the weight of the Euro and devalued the Dirham by five per cent.

Table 7. FDI inflows to Morocco and other MENA countries (share in GDP), 1991-2002

	1991-96	97-2002	2001	2002
Egypt	1.4	1.1	0.6	0.8
Morocco	1.3	3.6	8.3	1.3
Tunisia	2.6	2.8	2.4	3.4
Jordan	0.1	8.5	2.3	1.3
Turkey	0.5	0.8	2.2	0.6

Source: Chemingui and Lahouel (2004)
Note: Gross inflows are expressed in million US$.

4.7. Public spending

According to Harris (2002), assessing the productivity effects of social policy is inherently difficult. Aside from the direct human capital effects, much of the impact is likely to be indirect, working through changes in incentives to invest, save or work or through induced fiscal effects on similar variables. In this respect, literature has investigated two categories of public spending, investment and consumption. Generally, the results favour slightly the productivity, or growth effects, of public sector investment but are distinctly negative in regard to public sector consumption. Differences in social spending between countries are the only form of evidence currently available to estimate the growth effects of social policy (Harris, *op cit.*).

Using the public finance classification, Morocco tends to spend little on public goods and services in relation to many other Arab countries. In 2001, public spending on health and education only represented two per cent and five per cent of GDP, respectively, compared to 4.9 and seven per cent in Tunisia. The spending gap is much higher for subsidies and direct transfers to households. In 1999, public spending on subsidies and direct transfers to households represented 16 per cent of total government spending, compared to 28 per cent in Tunisia. Giving greater emphasis on improving social services and their availability to the population appears an essential factor towards improving human capital in the country.[14]

[14] Fan and Hazell (1999) and Fan and Thorat (2001) provide an empirical analysis of the link between public spending and economic growth.

4.8. Labour policy

In addition to education and training policies, the degree to which firms rely relatively more intensively on labour vs. capital, is shaped by a broad set of policies. Public policies related to the Moroccan labour market include two main instruments, the minimum wage and non-salary wage costs, which directly affect labour costs.

In Morocco, minimum wages are negotiated between the Government and trade union representatives having little correlation with labour productivity. Guaranteed minimum wages in the industrial (SMIG) and agricultural (SMAG) sectors are increased on an irregular basis. Although nominal wages in SMIG and SMAG more than doubled between 1985 and 2000, in real terms, the increase was only some 20 per cent (USAID, 2003). In the context of increasing competition and given that most activities in Morocco are labour-intensive, increasing minimum wages by more than the inflation rate or productivity levels represents an additional obstacle towards economic development.

Non-salary wage costs include general income tax, pension contributions and health insurance contributions. Recent analysis indicates that for a minimum wage worker, non-wage taxes and social costs amount to 18.7 per cent, whereas, for an upper-level manager, they amount to 49.4 per cent. This policy introduces more distortions in the labour market. According to USAID (2003), the marginal cost of labour for a firm is at least twice as important as its social cost for a lead manager and is more than 42 per cent for an average salary worker. Thus, firms tend to substitute to an excessive degree capital for labour and to withdraw from certain labour-intensive activities.

5. Conclusions

Results from standard sources-of-growth analysis suggest that between 1960 and 2000, TFP growth contributed some 30 per cent to overall growth. A breakdown of the sample period into sub-periods reveals that the contribution of TFP growth has declined over time, even turning negative in the last sub-period. Further exploring the sources of growth, TFP growth was decomposed into technical progress and change in technical efficiency. Seen over the entire period, change in technical efficiency contributed positively and outweighed a negative contribution from what actually turned out to be negative technical progress. However, in the last sub-period, the roles of the two components reversed, implying that Morocco appears to have started to lag behind the world technology frontier. Because technical progress was unable to compensate for this loss, change in TFP was, accordingly, negative.

Several reasons, including policy failures, may explain the observed poor trend in productivity performance. In this paper, inadequate infrastructure, weak institutional and educational systems, high tariffs and an inefficient financial system are argued to be important. Examples of policy failures are too low public spending on education and health and allowing the real exchange rate to appreciate, thus harming the competitiveness of Moroccan industry. Enhanced policymaking relating to the labour market, as well as trade and foreign direct investment, likewise seem desirable.

The Moroccan Government recently implemented structural reforms to rectify the situation. The focus is on improving the environment to strengthen private sector-led growth and address weaknesses in the social sector. Particular emphasis has been given to upgrading the judicial system (e.g., amendments to corporate laws and bankruptcy procedures), restructuring the financial sector, reorienting education towards basic instruction and higher enrolment, and simplifying the regulatory environment.

Although it is too early to see the effects of reform on productivity performance, it is a step in the right direction. However, serious investment is lacking in infrastructure, which is important for facilitating industrialization (Hulten and Isaksson, 2007b). As more data become available, future research will be able to evaluate the economic effects of the reforms. An extension of this study would be to analyse formally the determinants of productivity and overall economic growth.

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Printed in Austria
V.08-52235—April 2008—200

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