

A Note on Growth Accounting for Post-War Lebanon: Preliminary Analysis and Policy Implications

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1. Introduction

In early 2017, the giant American chipmaker, *Intel*, paid \$15.3 billion for *Mobileye*, an Israeli firm that is at the forefront of autonomous-car technology¹. The deal was not the first to involve an Israeli-tech firm attracting foreign buyers, but it was the biggest². Interestingly, the deal was also around 50% more than the entire market capitalization of the Beirut Stock Exchange. That Israel has become IT-savvy is not important in itself, but what is important is that it brings to mind the crucial role that technology and production efficiency play in the growth process – or, what is known in the literature as Total Factor Productivity (TFP). Countries that can squeeze a lot of growth out of TFP do not in principle have to worry about increasing labor and capital for growth since the efficient use of the latter two variables obviates that need. But very few countries can be that lucky, especially if they are developing countries, and more so if they go through recurrent political instability.

That is of course the experience of the post-war Lebanese economy. What I intend to do in this short note is to see what role did TFP play in the post-war growth experience of 1992-2014. Lebanon is generally known to have an educated people, and during the rebuilding period it has undergone considerable capital accumulation. But it has also been subject to political setbacks that sapped its energies. So what was its growth accounting like? And how did its sources of growth fare? In section 2 I present the standard growth accounting equation and provide evidence on comparable countries and regions. In section 3 I provide estimates for Lebanon on the contribution of TFP, labor, and capital to growth, and find that TFP growth has averaged 0.52% annually, better than most Arab countries but worse than dynamic emerging economies. In section 4 I argue for a host of general but crucial policy implications on how to improve TFP and to upgrade the economy. In section 5 I conclude the note by highlighting the political-economy importance of formulating and implementing TFP-enhancing policies that will steer Lebanon onto a course of sustainable, long-term growth.

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¹ *Economist*, March 18-24, 2017.

² For a sympathetic discussion on how Israel has become an IT hub, see Senor, D. and Singer, S. (2009). *Start-Up Nation*. Hachette Book Group.

2. Standard Equation

The simple equation to undertake growth accounting is the Cobb-Douglas production function of the form:

$$(1) \quad Y = AL^\alpha K^\beta$$

where Y is physical output, L is labor, K is capital, α is the share of labor in output, β is the share of capital in output, and A is TFP³. TFP is the most interesting variable here because it reflects the contribution to output that is aside from that of labor and capital. It is about the “intangibles” that are not accounted for in the “tangibles” of factor accumulation. In other words, it relates to factors that determine the overall efficiency of production: political stability and security, level of technology, competency of human capital, quality of management and governance, strength of institutions and property rights, and cultural factors. It is perhaps one of the most important single measures to capture and evaluate the competitiveness of an economy or sector.

If we take the log differential of equation (1), we get:

$$(2) \quad Y^* = A^* + \alpha L^* + \beta K^*$$

where the symbol * on the top-right of each variable reflects the rate of growth. Equation (2) simply states that the growth of output, Y^* , is the sum of the growth in TFP, A^* , and the growth of labor, L^* , weighted by the share of labor in output α , and the growth of capital, K^* , weighted by the share of capital in output β .

Perhaps the fundamental part of equation (2) relates to the contribution of TFP to growth, A^* . In the growth literature, this has been referred to as the “growth residual”, because it is calculated as the difference between the growth of output and average weighted growth of inputs (labor and capital). For developed economies, TFP contributes close to 40% of growth in output, making growth an intensive process that is dependent on the quality of inputs rather than the quantity – or, more bluntly, on being “smart” rather than being “big”.

The interesting evidence comes from developing countries, where TFP contributes no more than 10% to growth, clearly indicating that growth is still largely an extensive process⁴. It gets worse for the Arab countries, where the contribution of TFP has been zero and sometimes negative, sadly implying that TFP has contracted from production efficiency and economic

³ I assume here a production function homogenous of degree one, which naturally implies that $\alpha + \beta = 1$. Also, α and β are, respectively, the elasticity of output with respect to labor and with respect to capital.

⁴ See Bosworth, B. and Collins, S. (2003). “The Empirics of Growth: An Update”. *Brookings Papers on Economic Activity*, 2.

output⁵. Not only that, close to 75% of growth came from the accumulation of physical capital, clearly also making the contribution of utilized labor and human capital quite minimal and helping to explain the high unemployment rates prevalent in Arab countries. What is interesting is that these outcomes did not spare the buoyant, modernizing GCC countries, for evidence shows that TFP growth was negative for all of these countries between 1990 and 2009, and only positive for three countries when non-oil output is considered: Kuwait, Oman, and UAE, with annual TFP growth of 0.9%, 0.8%, and 0.2% respectively⁶.

The two countries that are perhaps glaring exceptions to the above are China and Israel. China has returned to the world economic stage with gusto, averaging an annual GDP growth rate of 9.2% between 1978 and 2004, but just as important an average TFP growth of 4% -- making TFP's contribution to output growth at 43.5%, even better than that of developed economies. While less advertised, Israel's experience has been equally notable: GDP growth averaged 4.3% and TFP growth 1.97%, indicating that TFP's contribution to output growth was at 45.8%⁷.

3. Empirical Estimates

What about Lebanon? The difficulty of studying the growth accounting experience of Lebanon is the paucity of data. So before I analyze the Lebanese case, a few words on how the data for equation (2) were generated.

First, as far as α and β are concerned, there are no national income accounts for Lebanon covering the full post-war period of 1992-2014. So in order to get estimates for them, I resorted to a proxy based on tax revenues. More specifically, taxes collected on wages (labor income) were about 30% of the taxes collected on profits (capital income). Assuming (validly) that tax evasion in Lebanon is equally prevalent for both labor and capital, and considering that the corporate tax rate is 15% and the average individual tax rate is 10% (individual tax rates range between 2% and 20%), then labor income's share, α , should be higher than 30% by a third or should be 40%. This puts capital income, β , at 60%⁸.

Second, calculation of the growth in the capital stock, K^* , is usually done by applying the Perpetual Inventory Method (PIM), but this method assumes an estimate for the capital stock prior to 1992. This is hard to figure out for Lebanon because of the indeterminate impact of the

⁵ See Abu-Qarn, A. and Abu-Bader, S. (2007). "A vs K Revisited: Evidence from Selected MENA Countries". *World Development*, 35, 5.

⁶ See Espinoza, R. (2012). "Factor Accumulation and the Determinants of TFP in the GCC". *Oxford Center for the Analysis of Resource Rich Economies, OxCarre Research Paper 94*.

⁷ See Bosworth, B. and Collins, S. (2008). "Accounting for Growth: Comparing China and India", *Journal of Economic Perspectives*, 22, 1; and Nehru, V. and Dhareshwar, A. (2004). "New Estimates of Total Factor Productivity Growth: for Developing and Industrial Countries", *World Bank, Policy Research Working Paper 1313*.

⁸ This is consistent with new evidence assigning lower α for raw labor and higher β for capital and its externalities; see Abu-Qarn and Abu-Bader (2007).

civil war (1975-1991) on the capital stock back then. Instead, I will arrive at an estimate for K^* using the concept of the Incremental Capital Output Ratio (ICOR), and since it is a fairly technical argument I will relay it to a footnote⁹. Suffice it to say that the inverse of ICOR measures the growth in output per unit of investment; hence, the total growth in output will be equal to the inverse of ICOR multiplied by total investment or the investment ratio. Weighted by β , that will capture then the growth of output attributed to capital.

Lastly, regarding the growth rate of labor, L^* , it is calculated as the growth rate of employed labor, the latter equal to the labor force minus unemployed labor, as obtained from the *World Bank* data set for Lebanon.

Table (1): Lebanon: Growth Accounting: Average Annual Growth Rates, 1992-2014 (%)

Period	Y^*	$A^*(TFP^*)$	αL^*	βK^*
1992-2014	4.69	0.52	1.74	2.43
1992-1998	6.31	1.95	1.15	3.21
1999-2006	2.33	-2.33	1.85	2.82
2007-2010	9.20	2.24	1.46	5.49
2011-2014	2.05	-1.77	2.85	0.98

Source: World Bank and IMF data sets for Lebanon.

Table (1) displays the growth accounting numbers for Lebanon for the entire 1992-2014 period and for five consecutive sub-periods. For the average period, TFP growth, or A^* , was 0.52% annually, or contributing 11.1% of growth. Growth was more identified by physical capital accumulation, βK^* , at 2.43%, or more than 50% of growth. For the sub-periods, interesting patterns emerge. During the rebuilding period of 1992-1998, growth was notably identified by TFP at 1.95%, but more so by capital accumulation at 3.21%. A slowdown period followed, characterized by political bickering and culminated with Prime Minister Hariri's assassination in 2005. TFP did miserably during that period, robbing from growth at the rate of -2.33% annually. Only the momentum left over from the rebuilding period supported growth, as capital grew at 2.82%. The subsequent 2007-2010 period was underpinned by the Taif Accord of political

⁹ The Incremental Capital Output Ratio is defined as the change in capital needed to generate a given change in output, or:

$$(3) \quad ICOR = \frac{dK}{dY}$$

Noting that dK is equal to investment, I , then (3) becomes:

$$(4) \quad ICOR = \frac{I}{dY}$$

Adopting the reasonable assumption that the Incremental Capital Output Ratio is equal to the average capital output ratio, K/Y , then its inverse, Y/K , is reduced to:

$$(5) \quad Y/K = \frac{dY}{I} = 1/ICOR$$

Also, given that $K^* = dK/K = I/K = I/Y \cdot Y/K$. From (5), we then get:

$$(6) \quad K^* = I/Y \cdot 1/ICOR$$

Multiplying (6) by β , we get the growth in output attributed to K .

reconciliation. TFP did well, growing at 2.24%, but it is the construction boom in the real estate sector that did most of the work, with capital growing at 5.49%, again contributing more than 50% of growth. The last period, 2011 to 2014, was the most dismal, driven by political paralysis internally and the Syrian war externally. TFP was contracting from growth at -1.77% annually, and even capital accumulation suffered due to the dearth of investment, growing at 0.98% only. And it is the growth in labor, αL^* , that saved the day, growing at 2.85% and being loaded by inflows of low-cost Syrian labor and refugees, and contributing in the process more than 100% of growth.

So, post-war Lebanon has fared better than its Arab counterparts. Capital accumulation explained slightly more than 50% of growth, whereas TFP growth was positive and contributed close to 12% of growth. Hence, on average, both accumulation and, to a much lesser extent, production efficiency and technology explained Lebanese post-war growth. But, in comparison to countries like China and Israel, Lebanon has done poorly as far as TFP is concerned. You might ask, what is the contribution of education or human capital? And is not Lebanon considered a regional leader in this respect? I could not incorporate education into equation (1) because there are no annual data for human capital (like the average number of years of adult schooling), so it was effectively embedded in TFP. And even if I could, *education when separated can at best contribute to no more than a third of TFP growth* -- in other words, it can appropriate a maximum of only 0.18% out of the 0.52% in TFP growth¹⁰.

4. Policy Implications

It was always quite evident that political stability matters greatly to growth. Now we can put an approximate number on it. As reflected in TFP or production and technological efficiency, we saw that during the period of 1999-2006 *political instability* denied the economy -2.33% annually in growth, whereas during the period of 2007-2010 *political stability* added 2.24% -- so we can safely say that its impact on growth can be calculated as around 2.3%, either way. Moreover, this is the *minimum* impact, since it can affect additionally labor utilization (αL^*) and capital investments (βK^*). Hence, political stability is unsurprisingly of tremendous importance to growth and there is an urgent need to maintain it, and steadily so.

But TFP captures more than the impact of politics. We can clearly see that by comparing Lebanon with Israel. Israel's annual TFP growth of around 1.97% is more than three times that of Lebanon at 0.52%. Israel has its fair share of political instability – though, granted, not to the extent of Lebanon – but it has managed to become an emerging hub for high-end technological

¹⁰ For estimates of how much TFP growth is attributed to education, see Shackleton, R. (2013). "Total Factor Productivity Growth in Historical Perspective", *Congressional Budget Office, Working Paper 2013-1*. The comparable figures for education's contribution are 0.3% for China and 0.4% for Israel.

applications and a destination for lots of IT investments¹¹. So what we want for Lebanon is not only steady political stability so as to reduce risk for worthy long-term investments, but also a climate that fosters innovation and technological growth. This is simply because it is where TFP growth can be *magnified* and with it overall growth. The Central Bank of Lebanon's (BDL) 331 initiative is a welcome step in the right direction, but it is an isolated event within a sector that lacks momentum and especially a culture of venture capital, and an overall environment that still remains cumbersome to investments.¹² What needs to be broadly done in this respect is for the government to ease and perfect the grounds for doing business, and for the private sector to seize on these incentives and embark on investments that can ultimately transform the economy into a modern, "wired" economy – and away and beyond the sluggish, stale, and seasonal service sector¹³.

The private sector will need first and foremost an educated and innovative labor force to carry out these structural changes. We have previously thought that our educational system is good. This, however, is not exactly true. TFP growth in post-war Lebanon is low, and the contribution of education in it is small. So, either the best of our graduates have left the country or our education system has lost its luster – I think it is a bit of both. As a result, what we have to do in general to overcome these obstacles is to design an educational system that focuses more on the new technologies and applied sciences, reverses the widening skills gap, and exploits the rich synergies that exist between universities and the private sector¹⁴. And, needless to say, to forge a polity characterized by peace and stability. All this will go a long way towards allowing our graduates to have the staying opportunities to innovate and to build a sound future for them and for the country.

5. Conclusion

Using a standard model of growth accounting, the note explores the contribution of Total Factor Productivity (TFP) to post-war Lebanese growth, alongside the contribution of traditional inputs like labor and capital. At close to 12%, Lebanon's TFP growth contribution seems to be in line with that of the average for developing countries, and fares better than its Arab peers whose TFP growth rates were almost nil. However, it falls short of the 44% gauge attributed to some dynamic emerging countries, primarily Israel. Moreover, the paper highlights the variation in TFP's contribution to growth by linking it to adverse internal and regional political

¹¹ No doubt, Israel has benefited greatly in this respect from favorable US aid and technology transfers that also allowed it to build a dominant military-industrial complex,

¹² BDL's 331 initiative, which started in 2013, allows banks to invest 4% of their capital in IT start ups by covering 75% of their losses and reaping 50% of their profits. So far, close to \$400 million are invested by banks in these start-ups. However, no success stories and any IPOs have yet been achieved.

¹³ For more on structural transformations needed to steer away from the "service model", see Bolbol, A. (2014). "Whither the Lebanese Economy!", *ABL Monthly Bulletin*, no.11/November.

¹⁴ See UNDP. (2017). *Mind the Gap: A Labor Needs Assessment for Lebanon*. UNDP: Beirut, Lebanon.

developments. Also, a crucial implication of the note is that, whereas the contribution of labor and capital inputs into the growth process can be exhausted, TFP's positive contribution can be potentially limitless. In this respect, beyond the much-needed political stability factor, the country requires a new framework that caters for the sustainability of good TFP outcomes; and, as important, that does not ascribe undue primacy to the service sector.

In addition, TFP-enhancing schemes should transcend simply the modernization of ICT infrastructure and financing initiatives, and should involve the progressive recalibration of our states of mind and placing more emphasis on the applied sciences in education. And, at the political level, it helps stressing that economic "resistance" is just as noble and profound as all other resistances, and certainly the most enriching. Also, it helps realizing that the country is "crying" for an end to the political bickering, whose short-term political gains, if any, are futile and pale in comparison to the permanent economic gains that the country can reap when national, public interests ride above all factional interests and concerns. Finally, given that Lebanon's "natural resource" is its human capital, and noting that the latter is paramount to technological progress, there is a need then for a good working environment that aligns these two firmly together to exploit the opportunities for long-term TFP growth. It is only by doing all that the country can be ensured to thrive unabated, even in the presence of adverse consequences from the turbulent regional climate around it. More fundamentally, what all this seems to depend on is the honest answer to a simple but profound question: do we really want Lebanon to become a better country or not?