Education and Allocation of Skills in Tunisia: Evidence from an Education Reform

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Abstract

An often cited explanation for the weak growth effects of education in developing countries is the misallocation of educated workers to inefficient activities in the public sector. This paper assess the strength of this argument by studying the effect of educational attainment on employment status of Tunisian men. We exploit policy changes that restricted access to secondary education in the 1970's as an instrument for education and use data from 2004 Tunisian census as well as 2010 Labor Force Survey to estimate the effect of education on working in different sectors and within specific occupational categories. The results suggest that education increases employment, but that this increase is concentrated either in relatively low skill white collar occupations or in managerial jobs in the public sector. Given that our instrument probably affected the academically weaker students this pattern of results is consistent with the misallocation argument.

1 Introduction

Inefficient allocation of skilled labor across different economic activities is often cited as one the of the primary reasons for the disappointingly weak growth effects of public investments in education in many developing countries. According to this argument, often attributed to Pritchett (2001), education works as a gateway to inefficient activities, such as unproductive public sector employment, rather than boosting productivity in the competitive and open sectors of the economy. This paper is an attempt to assess the strength of this argument by providing evidence on the effect of education on the employment status of Tunisian men in different sectors. We exploit a policy change that restricted the access to secondary schools for several cohorts in the 1970's as an instrument for educational attainment and use Tunisian census and labor force survey data to estimate the effect of educational attainment on occupational outcomes.

Middle Eastern and North African (MENA) countries are usually portrayed as primary examples of countries where expectations related to educational investments have been unfulfilled. Even though these countries invested heavily in education after gaining independence in post WW II period, the economic growth has been disappointing. Indeed, Makdisi, Fattah, and Limam (2000) show that the level education has not been a significant determinant of economic growth in MENA countries. The experience of Tunisia is a typical example of this pattern. Investment in education was for a long time larger than in most countries in the developing region. Despite these investments, however, both GDP growth and total factor productivity growth have been very low since the 1980's.

Previous literature on the effects of education investments in MENA countries have focused on the estimation of private returns to education and has typically reported estimates that are comparable to the ones obtained in industrialized countries. This pattern of results would suggest that, at least at the private level, educational investment does pay off also in this region. However, previous literature also points to potential inefficiencies. Salehi-Isfahani, Tunali, and Assaad (2009) report estimates that seem to suggest that returns are convex in the level of education in Egypt and Iran and interpret this evidence of "sheepskin effects", that is returns attached to official degrees rather than actual learning. Assaad (1997) and Tansel (2005) provide evidence on the attractiveness of public sector employment for university graduates in Egypt and Turkey, respectively. However, due to lack of suitable instruments, this literature has been unable to address the causality of these estimates.

There are several reasons for why obtaining estimates purged from selection biases is useful for understanding the inefficiencies related to educational investment in the MENA region. First, evidence on how the skills obtained through schooling, rather than the unobserved abilities that are correlated with schooling levels, are allocated tells us how the labor market rewards schooling. This evidence can be used to assess the usefulness of the skills that are taught at schools as well as the efficiency of the labor market in allocating skills. Furthermore, evidence on the causal evidence on the allocation of educated workers can be used to predict the potential effects of policies that seek to affect educational attainment in the same way as the instruments used in the analysis do.

Here we exploit a policy change that took place in Tunisia in the 1970's. Following the rapid expansion of public education in the 1960's that led to increased budgetary pressures, the Tunisian government responded by restricting the access to secondary education drastically. The promotion rates to secondary education were decreased by 15 percentage points starting 1971 and remained at low levels until 1980. This policy change generates between cohorts variation in educational attainment and we use this variation as an instrument for educational attainment. The first stage results suggest that the policy change is a strong instrument: individuals that were affected by the reform completed on average one grade less of education and were almost 10 percentage points less likely to obtain a university degree.[1]

We use micro data from Tunisian 2004 census and 2010 Labor Force Survey to estimate the effect of educational attainment on employment and occupational status of men in different sectors, focusing on the distinctions between the public and the private corporate sector. Descriptive statistics and OLS results suggest no inefficient over-representation of educated workers in the public sector. The public administration does employ more college workers, but this appears to be due to the specific occupational structure of the sector, particularly its abundance of health and education workers.

However, using the changes in the access to secondary education as an instrument for education does deliver results that are consistent with inefficient absorption of educated workers by the public sector. First, IV estimates of the effect of education on working in the public sector exceeds the effect on working in the private sector. This suggests that educational attainment, when purged from the effect of other productive characteristics, works as a gateway to public sector jobs in the Tunisian labor market. The pattern, however, could still be driven by differing occupation structures across sectors. Our second set of results thus focuses on differences across sectors in selected occupations.

[1] Our identification strategy is very similar to the one that Harmon and Walker (1995), Oreopoulos (2006), and Pischke and von Wachter (2008) have used to estimate the returns to education in industrialized countries.

Our IV estimates show a clear effect for clerical workers in all sectors, but no effect on natural science occupations. Furthermore, the effect of education on working in technical and, particularly, managerial jobs is heterogeneous across sectors: this effect is large in the public sector, considerably weaker in the private Tunisian sector and nonexistent in the multinational sector. This pattern of results suggests that the channel for the effect of formal education is not primarily through the acquisition of technical skills at school (arguably most useful in natural science occupations and least in clerical jobs). The fact that education has an effect on working in intermediate and, particularly, in managerial occupations in the public sector, while having no such effect in the multinational sector, is consistent with the idea that the public administration hires and promotes workers inefficiently, rewarding titles rather than actual skills.

The rest of the paper is organized as follows. In the following section we present a short history of educational investment in Tunisia and describe the policy reform that we will exploit in our identification strategy. The third section describes the data sets used in the analysis and presents some descriptive statistics on the allocation of educated workers in the Tunisian labor market. We then move on to present the results on the effect of educational attainment on the employment status. We report IV estimates of the effect of education on the probability of working in different sectors on average as well as separately for certain occupations. The fifth section concludes.

2 Education investment in Tunisia

Tunisia obtained its independence from France in 1956 in a relatively peaceful way. A single-party regime ensued, led by the Neo-Destourian party that had fought and negotiated independence. The political power was highly concentrated in the hands of the party leader, Habib Bourguiba. The party and its leader had a strong developmental and modernizing agenda. One of the key instruments of modernization was to be the spread of education to the Tunisian masses.

2.1 Expansion of education after independence

At the eve of independence the level of educational attainment was relatively low in Tunisia. In 1955, access to primary education was restricted with enrollment rates of 30% among 6-9 year olds. Furthermore the overall illiteracy rate was as high as 84% (Tarifa, 1971). The new regime spent great efforts to expand education. An education reform in 1958 forsaw complete schooling of six year olds by 1967 and allowed for a relatively open access to secondary school (around 40% access rate from primary to secondary) (Tibi, 1974). Expenditures in education reached 4.3% of GNP in 1965, larger than the average for any developing region (Bousnina, 1991). Enrollment rates of 6-9 year olds soared to 70% in 1967, only ten years after independence and enrollment in secondary schooling more than tripled from 1958 to 1966 (Tarifa, 1971).

Despite the quantitative success of the policy of educational expansion, by the end of the 1960s several problems were identified. First, as enrollments increased, so did the budget required to sustain the system. By 1970, expenditures in education reached 6% of GNP, a figure even higher than that of developed countries (UNESCO 1976 Yearbook, quoted in (Bousnina, 1991)). As expansion at the primary level spilled over increasingly to the much more expensive secondary and tertiary levels, there was a risk of explosive budget increases. Second, repetition rates were high, both at the primary and secondary levels. The concern emerged that the expansion into the secondary level had been too

massive, swelling the budget and including large amounts of unprepared students did not progress at the appropriate rate.

2.2 The policy reform of the 1970's

In this context, in 1971, the promotion rate into secondary school was dropped suddenly from 40% to around 25% (see Table 1). During a full decade promotion rates remained at such low levels. Meanwhile the budget, which in 1974 remained at 6.1 of GNP (UNESCO 1976 Yearbook, quoted in (Bousnina, 1991)), appears to have somewhat stabilized. However, it lead to an new problem: a large amount of youth below 16 years old were left out of the educational system at an age where they were still deemed to be not ready to join the workforce. In that context, in 1980, promotion rates were brought back to around 40% (Table 1).

The two sudden changes in promotion rates form the basis for our instrument for education. Whereas we have not found direct evidence of a purposeful manipulation of these rates, in the form of regulations or official proclamations, contemporary observers appear to agree that it was policy induced, at least when it comes to the first drop (Tibi 1974, Allen 1976). Indeed, the fact that promotion rates change so suddenly and remain relatively constant within each regime strongly suggests that it is driven by policy, not by some secular changes in cohorts.

We construct an instrument for education using these changes in promotion rates. We call the years of low promotion rates, the low promotion regime. Our instrument is a variable that captures exposure of different cohorts to the low promotion regime. If no one repeated grades, the instrument would take value one for cohorts reaching 12 years old between 1971 and 1980. Because of grade repetition, cohorts older than that had some exposure to the low promotion regime whereas the younger of these cohorts had only a limited exposure. Below, we describe the instrument in more detail and show that the policy used had a strong impact on the number of grades completed as well as on the probability of continuing studies beyond primary school.

3 Data

We use for our analysis two datasets, the 2004 Tunisian Census and the 2010 Tunisian Labor Force Survey (LFS) [2]. Our version of the 2004 Census has individual information on one fourth of Tunisian households (2,157,325 individuals). The LFS sample consists of 549,015 individuals.

3.1 Variables

Both datasets include individual information on education, labor market outcomes and demographic characteristics, as well as characteristics of the household such as possession of certain assets (cars, washing machines, etc., which we will use to construct a wealth index). In addition, both datasets provide sampling weights which we use in all our analyses below.

As was explained above, our analysis relies on policy changes affecting cohorts born around the 1960s. Thus, we restrict our sample to individuals born after 1945 and before 1980. This leaves us with around 10 to 15 cohorts before and after the cohorts affected by the policy and has the virtue of excluding most of retired people as well as students.

[2]The two datasets are available at http://www.ins.nat.tn/modules/nada/index.php/catalog

Moreover, we observe a clear agglomeration of observations with round years of birth, i.e. at years ending in 0 or in 5. This is likely to represent individuals unsure of their exact birth year. Because these individuals are not randomly selected, but rather appear to display particularly low education levels, we erase these observations. Finally, because the policy of interest had a substantially stronger impact on males than on females, we restrict our analysis to males. We end up with 354,610 census observations and 78,786 LFS observations.[3]

The main variables we will use in our analysis are education-related variables (levels of education and number of grades completed), occupation related variables (sector or place of employment and occupation) and an index of wealth [4]. For education, both datasets already include variables on the level of education arrived at (none, primary, secondary, university) as well as a variable with the number of grades completed of the respective education level. From these two variables, we construct the total years of education ("grades completed") on the basis of official length of each level for these cohorts (assuming a primary education of 6 grades and a secondary education of 7 grades).

The occupation-related variables include a variable on "workplace" and a 2-digit occupation category variable. The workplace variable includes as categories public administration, public companies, private Tunisian companies, multinational or mixed companies, shops, home, ambulant, agricultural, construction building, other construction sites and other places. From this variable, we will focus on the four fist categories, public administration and the three types of company, which we will denote from now on "sectors". The occupation variable consists of 9 main categories, each subdivided into two to five subcategories. The main categories are management, scientists, technicians, clerks, vendors, farmers, craftsmen, machine operators and unskilled workers. We will mainly focus on the while collar workers which are the first four ones.

For the wealth index, we use information on household assets as well as number of rooms in the household.[5] We perform a principle component analysis (PCA) of these variables and take the first component to be the wealth index. The results of the PCA appear sensible: factor loadings are lowest for assets ambiguously associated to social status, such as bicycles and motorbikes, and the first component of the PCA explains 25% of the total variance (32% in the case of the LFS).

4 Descriptive statistics

We are primarily interested in the links between educational attainment, wealth, sector of employment and occupation. Table 2 presents the descriptive statistics of these variables in our samples. Recall that both samples are restricted to specific cohorts of middle-aged males, that were between 24 and 59 when the Census was taken in 2004 and between 30 and 65 at the time of the LFS, in 2010. The table shows that our sample of males have on average more than 7 years of education, one more than the length of primary school. Employment rates are unsurprisingly high, at around 80%. The wealth index has no natural interpretation of units but it is useful to notice the scale of the index as proxied by a standard deviation of 2 (the index ranges roughly from -10 to 10).

[3] In our analyses involving wealth, we merge the individual with its corresponding household dataset and we further restrict ourselves to household heads, leading to 294,068 for the Census data and 75,200 for the LFS.

[4] The Labor Force Survey also includes questions on wages. However, this information is not released

[5] The household assets are bicycle, motorbike, car, radio, TV, satellite dish, library, fridge, freezer, oven, washing machine, dish washer, air conditioner, central heating, fixed phone, mobile phone, computer and internet. We also add access to piped water and to grid electricity.

Table 2 shows that the public sector is a significant, although not massive, provider of employment. Around one fourth of the employed in our samples work in the public sector, either in the administration (most of them), or in public companies. Employment in private companies is somewhat lower but not substantially so, as are employment in agricultural fields and at construction sites. From here onward our interest will lie in the first four employment sectors (public administration, public companies, private Tunisian companies and multinationals), and we will lump together the other workplaces. Regarding occupations, in what follows we will be focusing specifically on white collar occupations (managers, scientists, technicians, and clerks), and we will disaggregate these further when useful.

A last feature to notice in Table 2 is the similarity between the census and the LFS figures, which gives certain confidence on the quality of the data. The main differences between the two samples are the slightly higher proportion of employed and managers in the LFS, both of which are consistent with the cohorts being older in that sample.

As a first pass at the question of skill absorption by the public sector, Table 3 displays the skill distribution within the different sectors. The table does show the public sector as particularly skill intensive. In particular, the public administration employs the largest share of workers with college, relative to other sectors. Still, both public and private sector companies are relatively skill intensive relative to the other workplaces. Private Tunisian companies are slightly less skilled intensive than the other types of companies. The differences in skill are broadly mirrored in differences in average wealth of workers in different sectors. Notice also that public companies and multinationals are very similar in skill composition (as well as in size, as could be seen in the previous table). In the analysis below it will often be useful to focus on comparisons between these two sectors.

That the public administration is the most skill intensive need not imply that the public sector is absorbing college students inefficiently. The technological requirements of a public administration may be such that comparatively more skills are needed to perform its tasks. We thus consider whether the differences in skill appear to be driven by differences in occupation types or to skill levels within occupations. Table 4 shows the distribution of occupations across sectors, where we have disaggregated white collar occupations into subcategories. The last row shows the marginal distribution of sectors, for comparison. It is clear that there are strong differences in occupation across sectors. Our four selected sectors have a clear overrepresentation of top occupation categories relative the "other" workplaces. The same applies to the public administration, relative to public and private companies. The public administration employs a disproportionate proportion of education and health workers, occupations with high skill requirements.

In order to check if, in addition to differences in occupational structure, the public administration displays high skill intensity also within occupations we select certain occupational categories. We do so because making cross sectoral comparisons within occupations that are not homogeneously distributed across sectors are likely to be misleading (for instance, the tiny amount of education workers in the multinational sector are likely to be essentially different than the large amount of public sector educational workers; comparisons between them are likely to be potentially misleading). We will thus focus on occupations that are roughly proportionately distributed across sectors: among management we select company director; as scientists and technicians we select scientific and other occupations; and as clerical jobs we select both subcategories.

Table 5 shows the average grades completed within the selected occupation categories and sectors. Within each occupation category, mean education levels are relatively similar across sectors (except "other scientists", that display lower education levels in the public

administration). Certainly there are no large systematic differences between sectors: the unusual skill intensity of the public administration appears to be due to its occupation composition rather than the skill content in each occupation.

Table 5 also provides some additional confidence regarding the quality of the data used. Education levels by occupation category are sensible, with highest levels for scientists and lowest levels for clerks. The table shows in its last column the mean wealth level for each occupation category. Here again, results are as reassuring, with wealth levels increasing with the occupational hierarchy. Consistent with what one would expect, but nevertheless worth mentioning, is the fact that directors display on average slightly higher wealth levels than natural scientists, despite their lower average educational attainment.

In summary, the descriptive analysis does not point at very obvious overhiring of educated workers by the public sector. Public companies have similar skill distributions than private ones (particularly multinational ones). The public administration does employ more college graduates than public and private companies, but this appears mainly related to the specific occupational structure of the public sector and not the skill content within occupations. However, it is important to note that the descriptive statistics presented here do not really inform us about the effect of educational attainment on the employment status. Since education is likely to be correlated with other determinants of employment status the correlations between education and allocation of workers in these table is, at least partly, spurious. To understand how educational attainment affects employment status among Tunisian men, we exploit the policy changes of the 1970's in the following section.

5 Results

Our aim is to estimate the effect of educational attainment on the probability of being employed in public, private Tunisian, and multinational sectors. We denote these probabilities with Y_i. The empirical framework for estimating these effects is given by:

$$Y_i = f(C_i) + \beta \text{SCH}_i + \epsilon_i \tag{1}$$

where C_i denotes the birth cohort of individual i and SCH_i refers to i's level of schooling measured with a dummy variable that takes value one if the individuals has obtained a post-primary degree. We specify the function f as a flexible polynomial of birth year and in our baseline regressions we use a polynomial of order three. We also apply polynomials of order five in robustness checks.[6]

Since educational attainment is likely to be correlated with unobservable determinants of employment outcomes SCH_i will be correlated with the error term ϵ in (1). To overcome this endogeneity problem we exploit the policy reform described in section 2, and specify SCH_i as:

$$\text{SCH}_i = f(C_i) + \gamma R_i + v_i \tag{2}$$

where R_i is our reform variable. As was explained above the regime decreased access to secondary education in 1971 and then increased it again in 1980. As the secondary school entry age in the Tunisian system is 12, without any grade repetition this variable would take values 1 for cohorts born between 1959 and 1968. However, due to widespread grade repetition some cohorts born before 1959 were also affected by the stricter access

[6] When using the Labor Force Survey data we also include a control variable for retirement in equation (1) since part of our sample has reached the retirement age by 2010.

requirements of 1971. In the same way, parts of the cohorts born between 1964-1968 were affected by the more lenient regime. In order to take into account repetition rates in this manner, we use information detailing the year-of-birth composition of each primary school grade in Ministde l'Éducation Nationale, Republique Tunissiene (1983) and extrapolate this information to the two instances of policy change. We end up with exposure equaling one for the cohort reaching 12 in 1971 (born in 1969), and decreasing almost linearly for 4 older cohorts (0.8 for those born in 1958, 0.53 for those born in 1957, etc.). The reverse applies to the 1980 policy change. Figure 1 depicts the values of the variable R_i by birth cohorts.

5.1 First stage results

The estimates of the effect of the policy reform on educational attainment are reported in table 6. We present results on two outcome variables: total number of grades completed and the probability of continuing studies beyond primary school. As is clear from table 6, the reform decreased the amount of grades completed by approximately one. Similarly, the probability of obtaining a post-primary education decreased by ten percentage points which implies a decrease of one fifth in the fraction of cohort that continued their studies after primary school. In what follows, we will use this latter variable as our preferred measure of educational attainment.

The satisfactory performance of the instrument is also apparent when inspecting graphs of educational attainment by cohort. Figure 2 shows grades completed and probability of continuing studies beyond primary school by birth cohort, using the census data. Together with the means by cohort, the figures show predictions from the first-stage regressions (3rd order polynomial) with the instrument turned on (solid line) and also turned off (dashed line). Together table 6 and figure 2 clearly show that restricting access to secondary education in the 1970's had an effect on educational attainment.

5.2 The effect of education on occupational status

The first question we consider is the effect of education on the probability of obtaining employment in the public sector and in private companies. Table 7 reports both IV and OLS results, using our two datasets. Consider first the IV results using the census data. All coefficients are positive and statistically significant at conventional levels. The fact of attending secondary or university education, per se, increases the chances of working in the public sector and in private companies. The coefficients differ substantially across sectors, partly because the sectors are of substantially different size. However, differences remain large even when focusing on the size of the coefficient *relative* to the size of the sector (as given in the before-last row). For the public administration, where around 20% of the workforce are employed, the mere fact of attending higher education increases the chances of working there by a staggering 50pp, more than twice the size of the sector. The effect is also very large for public companies with a coefficient 1.5 times the size of the sector. The effects are smallest in relative terms (though still significant) for the private sector companies, with coefficients approximately equal to the sizes of the sectors. The estimates get reduced when using the LFS instead of the census, particularly for the three types of company, although coefficients are much less precisely estimated.

Table 8 shows the IV estimates of educational attainment on the probability of working in the selected occupations by sector. In addition to coefficients and standard errors, the table reports the size of each occupation in each sector. The coefficients of the table are generally positive with two important types of exception. First, coefficients on

scientific/technical occupations are essentially zero, for all sectors. Second, coefficients are generally essentially zero for the multinational sector, except for clerical jobs. To further illustrate this pattern of results, we present the reduced from effects of the reform on working as a director in different industries in figure 3. The graphs in this figure plot the fraction of the labor force employed in this occupation by sector as well as the predictions from regressions where the probabilities are regressed on the 3rd order polynomial of birth cohorts with the instrument turned on (solid line) and off (dashed line).[7] These figures show the dramatic drop in the probability of working as a director in the public sector while there is essentially no drop in the case of multinationals.

5.3 Discussion of the results

The results presented above indicate that the changes in educational attainment generated by the policy changes in the 1970's clearly had an effect on the employment status of Tunisian men. As is always the case with instrumental variables, these results do not tell us anything about whose education and labor market status was effected. However, the nature of the policy change that we use to instrument educational attainment suggests that those whose education was really affected by the policy were the ones on the margin of gaining an access to secondary school. Hence, we are most likely estimating the effects of educational attainment on the employment status for individuals that are among the weakest students who continue their studies beyond primary school.

The results in table 8 and figure 3, provide further suggestive evidence that, in our opinion, supports the interpretation that the compliers are the academically weaker students. According to these results formal education enabled the compliers of our instrument to obtain white collar jobs in sectors and occupations where skills are actually valued the least: occupations not requiring the highest levels of skill and in sectors more shielded from competitive pressures. This is consistent with the fact that the compliers of our instrument are likely to be relatively weak academically.

Pushing the argument further, what our results suggest is that the both the public and, to a lesser extent, the Tunisian corporate sector do absorb certain types of workers by virtue of their formal education, regardless of skill. This pattern is most remarkable when it comes to managers. We find strong effects of education on obtaining managerial positions in the public and private Tunisian sectors. Relative to the size of the occupations in each sector, the size of the effects are very large, more than five times larger for the public sectors and around twice as large for the private Tunisian sector. It is also worth noting that the largest relative effects are for the public sector.

It is particularly instructive to elaborate on the differential effects for managers and clerical jobs in different sectors. It seems sensible to assume that productivity is more sensitive to skill in managerial jobs than in clerical jobs. Managerial jobs are also more likely to be obtained after several years of experience in the labor market while clerical jobs need not be. At the same time, true skill is more likely to be observed only with experience and employers might need rely on formal education as skill signaling device. These three observations imply that an organization operating efficiently is likely to follow different strategies for clerical workers than with managers. In particular, formal education per se ought to matter less for hiring and promoting managers, since more information on their true skill ought to be available and getting the skill right is likely to be more relevant for these. This is exactly what we observe for the multinational sector. For the public sector

[7] In order to facilitate comparisons across sectors, the scale of each graph is set relative to the size of the sector.

and the Tunisian corporate sector, in contrast, hiring and promoting appear to occur more automatically on the basis of formal qualifications, regardless of true skill. This evidence is consistently with findings suggesting that "sheepskin effects" are prevalent in public sectors across the MENA, and that they even spill over to the domestic corporate sector (see Salehi-Isfahani et al. (2009)). Moreover, our evidence is consistent with sheepskin effects applying all the way to managerial positions. In that respect, our findings are indicative of inefficient absorption of formally educated individuals in the Tunisian public sector *and*, to a lesser extent, in its domestic private sector.

6 Concluding Remarks

In this paper we estimate the effect of education on occupational status of Tunisian men, with the aim of obtaining insights into the possible inefficient absorption of educated workers into the public sector. We exploit a change in education policy that reduced promotion rates into secondary school from 1971 to 1980. The policy change is shown to have had a substantial effect on educational attainment of the cohorts affected. We use exposure to the policy as instrument for educational attainment.

Our findings suggest a limited acquisition of skills from schooling by the compliers of our instrument. The instrument we use is likely to have shocked the educational attainment of the academically weakest students and, indeed, we find an effect of education on white collar occupations where formal education is likely to be less relevant. In spite of this, we find that formal schooling increases substantially the chances of obtaining a managerial position in the public sector, a pattern not found in the multinational sector. This pattern of results is consistent with "sheepskin" effects, where hiring and promotions are based on titles rather than acquired skill.

Our results are thus consistent with a misallocation of labor towards and within the public sector. The normative implications of this are however not straightforward. In contexts where clientelism is prevalent (as it is likely to have been in the case of Tunisia during the period considered), the only realistic alternative may be an even more inefficient and unequitable allocation of jobs based on patronage. Having a clear set of rules for hiring and promotions in the public sector may reduce the scope of bureaucratic elites to allocate jobs for their personal gain.

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Table 1: Promotion Rates into Secondary School

prom	
1960	0.40
1962	0.40
1963	0.41
1964	0.42
1965	0.41
1966	0.42
1967	0.39
1968	0.40
1969	0.40
1970	0.35
1971	0.25
1972	0.22
1973	0.31
1974	0.25
1975	0.26
1976	0.26
1977	0.27
1978	0.26
1979	0.25
1980	0.38
1981	0.44

Table 2: Descriptive Satistics

dsmeans	Mean cns	SD cns	Mean lfs	SD lfs
Grades.completed	7.562	5	7.867	5
Wealth.index	0.150	2	0.773	2
Employed	0.787		0.830	
Education				
None	0.141		0.116	
Primary	0.381		0.405	
Secondary	0.345		0.341	
College	0.134		0.139	
Employment Sector				
pubadm	0.190		0.172	
pubcomp	0.032		0.034	
privtns	0.139		0.124	
multinat	0.023		0.031	
shop	0.144		0.168	
home	0.007		0.005	
ambulant	0.070		0.062	
agricultural	0.106		0.123	
construct.building	0.126		0.139	
construct.other	0.006		0.006	
other.places	0.013		0.011	
None	0.143		0.124	
Occupation				
Management	0.088		0.133	
Scientist	0.053		0.057	
Technician	0.061		0.054	
Clerk	0.045		0.038	
Vendor	0.096		0.089	
Farmer	0.074		0.101	
Craftsman	0.128		0.121	
Machine Operator	0.087		0.083	
Unskilled Worker	0.225		0.168	
None	0.143		0.156	

Table 3: Distribution of Skill by Sector

sctds	None	Primary	Secondary	College	grades.compl	wealth
pubadm	0.050	0.17	0.46	0.329	11.3	1.22
pubcomp	0.066	0.28	0.48	0.166	9.2	1.28
privtns	0.066	0.35	0.44	0.149	8.7	0.75
multinat	0.036	0.30	0.48	0.186	9.5	1.04
others	0.194	0.51	0.27	0.028	5.5	−0.55
None	0.194	0.31	0.30	0.191	7.7	−0.29

Table 4: Distribution of Skill by Occupation

occsctds	pubadm	pubcomp	privtns	multinat	others	None
Management						
Senior Govt and CEO	0.943	0.0223	0.015	0.0045	0.014	0.001
Company Director	0.324	0.0952	0.443	0.0918	0.043	0.003
SME Manager	0.007	0.0049	0.100	0.0057	0.881	0.002
Scientist						
Natural Scientist	0.323	0.1363	0.361	0.0875	0.089	0.003
Life Scientist	0.522	0.0276	0.088	0.0146	0.345	0.002
Secondary and University Teacher	0.965	0.0076	0.010	0.0018	0.014	0.001
Other Scientist	0.361	0.0568	0.291	0.0481	0.240	0.004
Technician						
Natural Science Technician	0.277	0.1544	0.350	0.0875	0.130	0.002
Life Science Technician	0.778	0.0377	0.086	0.0103	0.087	0.001
Primary School Teacher	0.920	0.0079	0.018	0.0007	0.051	0.002
Other Technician	0.378	0.0649	0.336	0.0545	0.162	0.005
Clerk						
Secretary	0.585	0.0961	0.228	0.0393	0.048	0.003
Receptionist	0.373	0.1319	0.308	0.0535	0.131	0.003
others						
Vendor	0.376	0.0180	0.131	0.0211	0.451	0.003
Farmer	0.016	0.0057	0.019	0.0028	0.956	0.001
Craftsman	0.043	0.0353	0.175	0.0236	0.721	0.002
Machine Operator	0.117	0.0680	0.312	0.0525	0.448	0.004
Unskilled Worker	0.116	0.0284	0.134	0.0249	0.694	0.002
None	0.006	0.0004	0.003	0.0005	0.003	0.987
All						
All	0.190	0.0322	0.139	0.0234	0.472	0.144

Table 5: Mean grades by Occupation and Sector

occsctgrades	pubadm	pubcomp	privtns	multinat	wealth
Company Director	15.0	14.6	14.0	14.1	3.47
Natural Scientist	16.6	16.9	16.9	17.2	3.36
Other Scientist	13.5	14.9	15.5	15.7	2.43
Natural Science Technician	12.5	12.2	12.1	12.8	1.63
Other Technician	11.9	11.3	11.8	12.0	1.62
Secretary	10.8	10.3	10.9	11.0	1.26
Receptionist	9.8	10.4	10.6	11.3	1.25

Table 6: First stage regressions of years of education and of reaching secondary or university education on the instrument

	grades.compl	grades.compl	grades.compl	sec.uni	sec.uni	sec.uni
D	-0.952	-0.785	-0.992	-0.1067	-0.0951	-0.1090
	(0.034)***	(0.058)***	(0.073)***	(0.0033)***	(0.0055)***	(0.0069)***
Mean.outc	7.56	7.56	7.87	0.48	0.48	0.47
SD.outc	5.15	5.15	5.10	0.50	0.50	0.50
Data.used	cns	cns	lfs	cns	cns	lfs
Poly.order	3	5	3	3	5	3
N	352129	352129	77982	354610	354610	78635

Robust standard errors in parenthesis. Signif. codes: 0.01 '***' 0.05 '**' 0.1 '*'.

Table 7: IV and OLS estimates of the effect of secondary and university education on sector of employment

	1	2	3	4
IV.cns	0.497	0.063	0.102	0.0323
	(0.025)***	(0.012)***	(0.022)***	(0.0087)***
OLS.cns	0.2477	0.02588	0.0570	0.01594
	(0.0014)***	(0.00067)***	(0.0013)***	(0.00057)***
IV.lfs	0.430	0.032	0.0056	0.014
	(0.084)***	(0.045)	(0.0726)	(0.035)
OLS.lfs	0.2319	0.0363	0.0484	0.0205
	(0.0029)***	(0.0015)***	(0.0028)***	(0.0014)***
Outcome.var	pubadm	pubcomp	privtns	multinat
Mean.outc	0.18	0.04	0.13	0.03
SD.outc	0.39	0.19	0.34	0.18

Robust standard errors in parenthesis. Signif. codes: 0.01 '***' 0.05 '**' 0.1 '*'.

Table 8: IV results on the effect of education on different occupations and sectors

tblocc2	pubadm	pubcomp	privtns	multinat	All
Company.Director	0.044	0.0121	0.0272	0.0035	0.09
	(0.006)***	(0.0034)***	(0.0068)***	(0.0030)	(0.01)***
	[0.006]	[0.002]	[0.009]	[0.002]	[0.020]
Natural.Scientist	-0.0043	0.0015	-0.0016	-0.00049	-0.00099
	(0.0042)	(0.0026)	(0.0040)	(0.00196)	(0.00697)
	[0.003]	[0.001]	[0.004]	[0.0009]	[0.010]
Other.Scientist	0.0204	0.0011	0.011	0.0019	0.0443
	(0.0041)***	(0.0017)	(0.003)***	(0.0013)	(0.0064)***
	[0.004]	[0.0006]	[0.003]	[0.0005]	[0.010]
Natural.Science.Technician	0.0025	0.0023	0.0053	-0.0019	0.0058
	(0.0046)	(0.0035)	(0.0041)	(0.0020)	(0.0077)
	[0.004]	[0.002]	[0.005]	[0.001]	[0.015]
Other.Technician	0.0141	0.0058	0.0163	-0.000021	0.0369
	(0.0054)***	(0.0023)**	(0.0047)***	(0.001730)	(0.0083)***
	[0.006]	[0.001]	[0.005]	[0.0009]	[0.016]
Secretary	0.0692	0.0099	0.0299	0.0043	0.115
	(0.0095)***	(0.0043)**	(0.0061)***	(0.0023)*	(0.012)***
	[0.02]	[0.003]	[0.008]	[0.001]	[0.036]
Receptionist	0.0067	0.0081	0.0126	0.0024	0.0349
	(0.0040)*	(0.0025)***	(0.0031)***	(0.0012)*	(0.0061)***
	[0.003]	[0.001]	[0.003]	[0.0005]	[0.009]

Robust standard errors in parenthesis. Signif. codes: 0.01 '***' 0.05 '**' 0.1 '*'. The figures in square brackets show the proportion of the workforce in each occupation in each sector

Figure 1: Value of the instrument by birth cohort

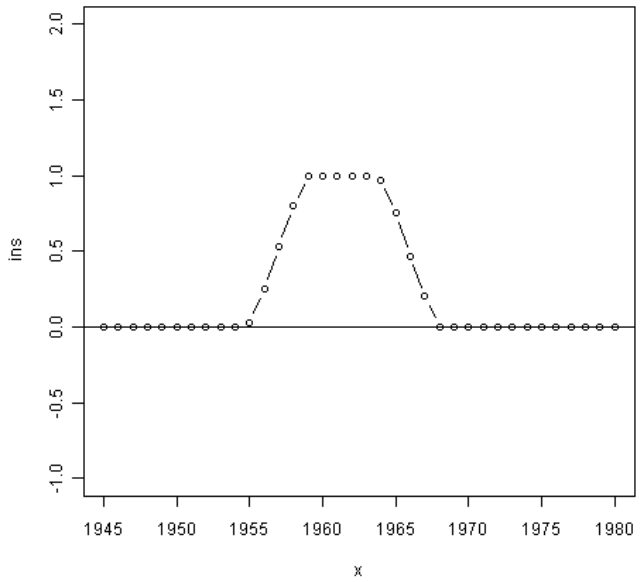

Figure 2: Graphical depiction of the First Stage: educational attainment by birth cohort

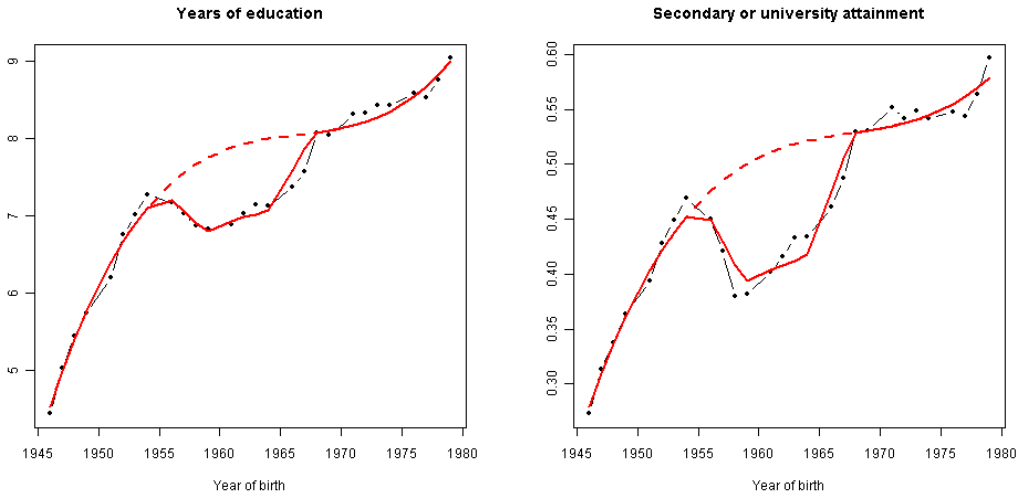

Figure 3: Proportion of managers by birth year in different sectors