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Uwe Dulleck
Paul Frijters
Rudolf Winter-Ebmer

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Reducing Start-up costs for New Firms: The Double Dividend on the Labor Market.*

Uwe Dulleck[†], Paul Frijters[‡]& Rudolf Winter-Ebmer[§]

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Abstract

Starting a firm with expansive potential is an option for educated and high-skilled workers. This option serves as an insurance against unemployment caused by labor market frictions and hence increases the incentives for education. We show within a matching model that reducing the start-up costs for new firms results in higher take-up rates of education. It also leads, through a thick-market externality, to higher rates of job creation for high-skilled labor as well as average match productivity. We provide empirical evidence to support our argument.

Keywords: Matching, Education, Start-up costs, Venture capital, Bureaucratic hurdles

JEL Classification: J24 (Human Capital, Occupational Choice), D73 (Bureaucracy), J68 (Mobility, Unemployment, and Vacancies - Public Policy)

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[†]Corresponding author: Department of Economics, University of Vienna, Hohenstaufengasse 9, 1010 Vienna, Austria, uwe.dulleck@univie.ac.at

[‡]Australian National University, RSSS, Economics.

[§]University of Linz, Institute for Advanced Studies, Vienna, CEPR and IZA

1 Introduction

The importance of entrepreneurship is gaining more attention.[1] The prime arguments to support the creation of new businesses concern innovation, the expansion of the 'boundaries of economic activity' (OECD, 1998b), and the adaptability of economies towards new opportunities. Governments and Chambers of Commerce argue that reduced start-up costs for new businesses are a potential cure for the ailing European labor market.

Reductions in start-up costs can take two forms. One is to reduce the bureaucratic hurdles that increase the start-up costs for new firms. The second is to provide institutions for venture capital as well as public financial support for new firms.[2]

In this paper we study the implications of lower start-up costs in the situation that new firms (at least, those with high productivity) can only be set up by high-skilled persons. Lower start-up costs then affect education choices by improving the options of skilled workers. This direct skill dividend to the labor market triggers, through a search externality, a second dividend: because the odds of getting high-skilled workers to apply for a given vacancy goes up, already existing firms create more jobs for high-skilled workers. We provide a model that identifies both these effects.

The current literature on starting firms focuses on the firm level and on how new firms influence existing markets.[3] Our contribution is to endogenize education decisions in this framework. Is there, however, any 'prima facie' empirical indication that lower start-up costs are related to educational choices? Figures 1 and 2 indeed show that two separate measures of start-up costs, namely the number of days it takes to set up a new firm and the availability of start-up finance, correlate with education choices.

At the very minimum, these graphs suggest there is some merit in further investigating a positive link between low start-up costs and incentives for

[1] See for example the Comission of the European Communities (1999) and the OECD (1998a, b).

[2] Another aspect of venture capital and its effect on labor markets is discussed theoretically and empirically by Belke et al. (2003). They argue in a matching framework that the availability of venture capital helps to select better managers.

[3] Much empirical research can be found on these issues. To name two examples: Audretsch et al. (1999) study industry dynamics and how the survival of new firms depends on start-up costs as well as industry characteristics. Gans et al. (2002) look empirically at the effects of start-up costs on the trade in ideas, innovation, and the founding of new firms in an industry.

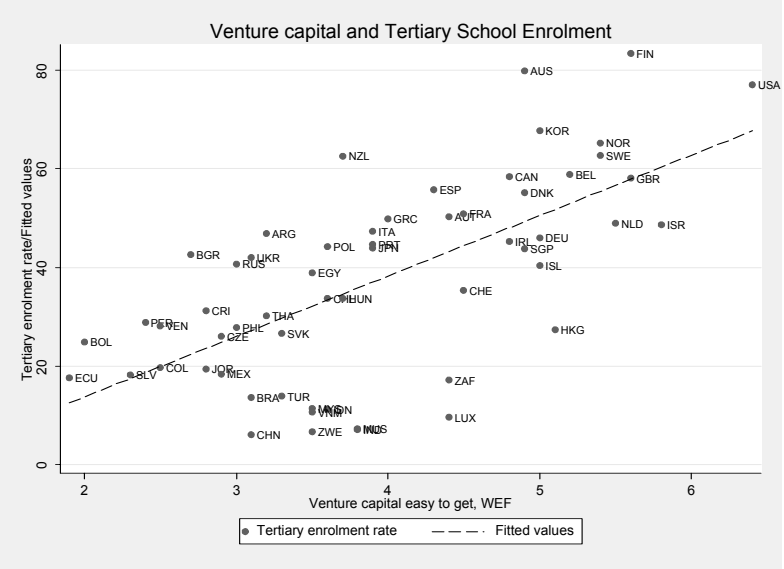

Figure 1: Venture Capital and Tertiary School Enrolment (Sources: UN World Development Indicators and Porter et al., 2000)

high-skilled education.

Our matching model is in the vein of Pissarides (2000) and Fonseca et al. (2001). In equilibrium, high-skilled workers first search for a high-skilled vacancy with existing firms. Search frictions prevent a perfect match between high-skilled vacancies and high-skilled job seekers. Some high-skilled unemployed then opt for setting up new firms until the value of outside low-skilled employment equalizes the value of creating a new firm. The equilibrium proportion of high-skilled vacancies is then determined by the proportion of high-skilled workers in the pool of unemployed, which links the proportion of high-skilled vacancies with the outside option for high-skilled workers of setting up a new firm. This gives rise to a matching externality: a larger share of high-skilled workers will increase the profitability of posting a high-skill vacancy for existing firms. This increases the number of high-skilled vacancies created when start-up costs for new firms decrease. Through this 'thick market externality' higher education rates lead to more job creation for high-skilled workers and this again adds to the incentives to invest in education. Under the specific assumptions of our model, lower start-up costs increase production and reduce the number of workers filling low-skilled jobs.

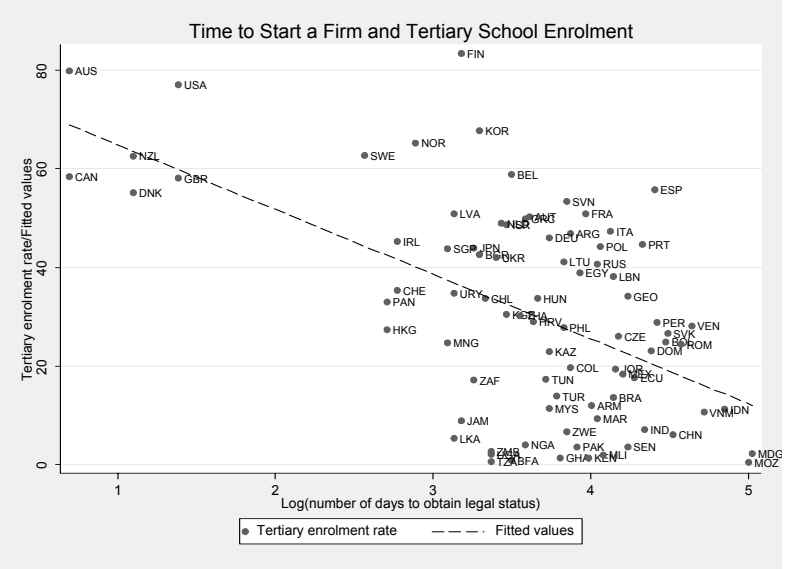

Figure 2: Time to Start a Firm and Tertiary School Enrolment (Sources: UN World Development Indicators and Djankov et al., 2002)

Closest to our approach is Fonseca et al. (2001) who study the effects of start-up costs in a matching model where workers are heterogeneous with respect to the potential profit of starting a new firm. Whilst not considering education, they also argue that lower start-up costs lead to more firms being created and less unemployment. The effect of reducing start-up costs on the efficiency of the market is ambiguous in their model: if too many workers start new firms, the workforce may become too small and output suffers. In contrast, lower start-up costs are always beneficial for the economy in our model.

A related line of enquiry is the link between education choices and search frictions. Acemoglu (1996) provides the basic intuition: workers decide on their investment in education before knowing whether they are able to find a high-skilled job. A higher proportion of educated workers then leads to more firms creating such jobs implying a wedge between private and social returns to education. Burdett and Smith's (2002) 'low skill trap' is based on a similar intuition: they provide a model with search frictions in which multiple equilibria exist, where firms offer either too few or too many high-skilled jobs

and workers either acquire or refrain from acquiring skills.[4] Where these papers differ from ours is that in our model search frictions are bounded by the option of setting up one's own firm.

Other policy options that affect the education choice of individuals are considered in the matching literature. Belot (2003) models education choices and migration options in case of labor market frictions. She argues that policies that increase migration possibilities also increase the incentives to invest in education. Another policy option is unemployment insurance, which effectively reduces the importance of unemployment risks and hence stimulates the unemployed to look for higher-paying riskier jobs. Acemoglu and Shimer (1999) show that unemployment insurance can thus be output increasing when the unemployed are risk-averse. When the possibility of taking a risky jobs is related to particular education choices, unemployment benefits affect education choices.

Our baseline model presented in Section 2 captures the basic search-friction argument. In Section 3, the baseline model is extended with the opportunity for high-skilled persons to start a new firm. We discuss and interpret the comparative statics of the model. We also provide a short discussion on the differences between policies to reduce bureaucratic hurdles vs. policies to provide venture capital. Section 4 contains empirical evidence that supports the main prediction of our model, namely the positive effect of start-up costs on skill acquisition. Section 5 concludes. All tables can be found in the Appendix.

2 A Matching Model with Education

2.1 The Basic Model

The economy consists of a fixed large number of firms and N workers. We consider a matching model with two time periods. In period one the workers in the economy decide whether they enroll in education and firms choose the number of vacancies for high and low-skilled jobs. In the second period, firms and workers are matched and production takes place.

[4] Masters (1998) studies the differences between wage bargaining and fixed rent sharing agreements in a model with investment by firms in capital and investment by workers in education. He finds that inefficiencies in the market have to be attributed to both search frictions and inefficiencies in the determination of wages.

With respect to the cost of education, workers have an innate ability $\theta \in [0;1]$. Ability is distributed over the population following a continuous cumulative distribution function $Q(\theta)$ on the support of [0,1]. Workers that choose to invest in education incur a cost of $e(\theta)$. By assumption, higher ability individuals have lower costs of education, i.e. $\frac{de(\theta)}{d\theta} < 0$. To guarantee an interior solution we assume that education is free for the most gifted worker ($e(1) = 0$) and impossible to achieve for the least gifted ($e(0) = \infty$). In all subsequent arguments, this will lead to a cut-off ability z above which workers become educated and below which they do not. Then, $1 - Q(z)$ is the share of workers becoming educated.

Firms can offer two types of jobs: low-skilled jobs and high-skilled jobs. To post a low- (high-)skilled vacancy imposes costs of c_l (c_h) on the firm. We denote the overall number of vacancies as V_l and V_h. Low-skilled jobs can be performed by any type of worker whereas high-skilled jobs can only be filled by high educated workers. Matching individuals to high-skilled jobs is by assumption more difficult than matching individuals to low-skilled jobs. For simplicity, we assume frictionless matching on the low-skill labor market, i.e. there is a spot-market for low-skilled jobs. The number of low-skilled matches equals $M_l = \min\{N_l; V_l\}$, where N_l and V_l refer to the number of workers seeking low-skilled jobs and the number of low-skill vacancies, respectively. Think of low-skilled jobs as hamburger-flipping positions which can be found at virtually no cost at all.[5]

With respect to high-skilled jobs we assume that matching frictions are captured by a constant returns to scale matching function $m(N_h, V_h)$. The number of educated workers N_h is equal to $(1-Q(z))N$. The number of successful high-skilled matches equals $M_h = m((1 - Q(z))N, V_h)$. Unsuccessful educated workers enter the low-skill labor market, which means we assume matching first takes place for high-skilled jobs and then for low-skilled jobs. The number of individuals prepared to accept low-skilled jobs thus equals $N - M_h$.

A successful match has productivity p_l, p_h respectively. We assume that wages in successful matches are determined by instantaneous Nash-bargaining where the power of workers is independent of education and equals β: wages are given as $w_l = \beta p_l$ and $w_h = \beta p_h$. To ensure that production takes place

[5] Assuming frictions on the market for low-skilled labor does not change the basic story because an increased probability of unemployment merely increases the value of the option to start a new firm.

we assume $(1-\beta)p_j > c_j$, $j \in \{l, h\}$. If this would not hold, there would be no low-skilled (high-skilled) workers at work, which is a trivial case.

2.2 Analysis of the Basic Model

We start with the behavior of firms with respect to low-skilled jobs. Firms will obviously set up low-skilled vacancies when there is a surplus in doing so. This is the case given the assumption on productivity: $(p_l - w_l)$ is by assumption bigger than c_l. To maximize profits, firms will post vacancies as long as the marginal expected profit is non-negative. This 'free entry' condition for low-skilled vacancies implies that the number of posted low-skilled vacancies solves

$$\frac{N - M_h}{V_l}(p_l - w_l) - c_l = 0. \tag{1}$$

The solution is $V_l = \frac{N-M_h}{c_l}(p_l - w_l)$. This must be higher than $N - M_h$ because $p_l - w_l > c_l$, which shows that there is an over-supply of low-skilled vacancies. This is rent-dissipation.

The number of individuals who choose to become educated is determined by the condition that the marginal individual is indifferent between becoming highly-educated or not. The equation determining z is given as

$$\frac{m((1-Q(z))N, V_h)}{(1-Q(z))N}(w_h - e(z)) + (1 - \frac{m((1-Q(z))N, V_h)}{(1-Q(z))N})(w_l - e(z)) = w_l \tag{2}$$

For the firm, setting up a marginal high-skilled vacancy must have zero-profits, which implies

$$\frac{m((1-Q(z))N, V_h)}{V_h}(p_h - w_h) = c_h \tag{3}$$

The following proposition states the result for the basic model.

Proposition 1 *In the basic model with education and low- and high-skilled jobs there exists a unique equilibrium, described by a set* $\{\tilde{V}_h, \tilde{V}_l, \tilde{z}\}$ *where* $\tilde{V}_h, \tilde{V}_l, \tilde{z}$ *denotes the equilibrium number of high- and low-skilled vacancies and the cut-off ability respectively.*

Proof. The proof runs via standard arguments: The productivity and the bargaining power uniquely determines V_l. Equations (2) and (3) determine

$\widetilde{V}_h$ and $\widetilde{z}$. Only one solution exists because for a given z, the marginal profit of an extra vacancy for high-skilled is monotonically decreasing in V_h. This implies there is only one (finite) level of V_h for any given z. Finally, the value of becoming high skilled is monotonically increasing in θ because of the decreasing education costs. Because of the assumptions on $e(.)$, there will be a unique level of z at which an individual is indifferent. This level is $\widetilde{z}$. In the simple model we hence have a unique equilibrium set $\{\tilde{V}_h, \tilde{V}_l, \widetilde{z}\}$. ■

3 Business Start-ups

3.1 Model Extension

We introduce the possibility for educated workers to start a business. The type of business we have in mind is obviously one with high productivity. This means we abstract from 'new firms' that are actually a form of low-skilled employment such as street vending.

An individual setting up his/her own high-skilled production job has to bear the cost SC. We assume that firms are more efficient in setting up such jobs than the unemployed are and that β is large enough such that accepting a high-skill job in a firm is more attractive to an educated worker than to start a business: $w_h > p_h - SC$ or $SC > (1-\beta)p_h$. This assumption implies $SC > c_h$, which reveals the intuition for the existence of firms in this economy, namely that economies of scale exist: a firm is more efficient than the unemployed in creating new jobs. To ensure that starting a firm is attractive for an educated worker in case of being hit by labor market friction, we assume $w_l < w_h - SC$ or $SC < \beta(p_h - p_l)$. Otherwise the new option of starting a business has no value because educated workers prefer to work in a low-skilled job rather than setting up a new firm. To summarize: we consider the case where the option to start a firm is attractive to an educated worker hit by labor market frictions: $w_h > p_h - SC > w_l$. All other cases are trivial.

3.2 The Value of Starting a New Firm

For the analysis, this new option changes the marginal condition (2) such that in equilibrium the following needs to hold

$$\frac{m((1-Q(z))N,V_h)}{(1-Q(z))N}(w_h-e(z))+(1-\frac{m((1-Q(z))N,V_h)}{(1-Q(z))N})(p_h-SC-e(z))=w_l. \tag{4}$$

This reveals the mechanism highlighted in this paper: becoming a high-educated individual is now more attractive because of the outside option of opening a new firm. This will unequivocally push down the equilibrium level $\tilde{z}$. This, in turn, will push up the value of a high-skilled vacancy for existing firms, which means more high-skilled vacancies will be created, which will again increase the value of becoming high-educated. Hence, $\tilde{V}_h$ will increase. We summarize this result in the following proposition.

Proposition 2 *Giving mismatched educated workers the option to start a new business leads to a larger share of workers acquiring education and to an increase of high-skill vacancies over the basic model.*

Proof. The result follows from the previous proof. By assumption $p_h-SC > \beta p_l$ hence the $e(z)$ solving equation (4) must be larger than the $e(z)$ solving (2), hence N_h is increasing. That $\tilde{V}_h$ increases follows from the monotonicity of $\tilde{V}_h$ with respect to N_h. ■

To study the effects of reduced start-up costs, we consider the comparative statics of an decrease in SC. We proceed by stating the result of the analysis in a proposition.

Proposition 3 *A reduction in start-up costs (SC) implies a higher rate of education and more vacancies for high-skilled jobs.*

Proof. The comparative statics yield the following equations:

$$[\triangle\tilde{z}\frac{\partial}{\partial\tilde{z}}+\triangle\tilde{V}_h\frac{\partial}{\partial\tilde{V}_h}][m(1,\frac{\tilde{V}_h}{N_h})(w_h-p_l+SC)+p_l-SC-e(\tilde{z})]=(1-m(1,\frac{\tilde{V}_h}{N_h}))\triangle SC \tag{5}$$

$$\triangle\tilde{z}\frac{\partial}{\partial\tilde{z}}m(\frac{N_h}{\tilde{V}_h},1)=-\triangle\tilde{V}_h\frac{\partial}{\partial\tilde{V}_h}m(\frac{N_h}{\tilde{V}_h},1) \tag{6}$$

which immediately reveals signs: because $\frac{\partial}{\partial \tilde{V}_h} m(\frac{N_h}{\tilde{V}_h}, 1) < 0$ and $\frac{\partial}{\partial \widetilde{z}} m(\frac{N_h}{\tilde{V}_h}, 1) < 0$, it follows that $\triangle \tilde{V}_h$ and $\triangle \widetilde{z}$ have opposite signs. Manipulating the equations further, we obtain

$$\frac{\triangle \widetilde{z}}{\triangle SC} = \frac{(1 - m(1, \frac{\tilde{V}_h}{N_h}))}{[\frac{\partial m(1, \frac{\tilde{V}_h}{N_h})}{\partial \widetilde{z}} + \frac{-\frac{\partial}{\partial \widetilde{z}} m(\frac{N_h}{\tilde{V}_h}, 1)}{\frac{\partial}{\partial \tilde{V}_h} m(\frac{N_h}{\tilde{V}_h}, 1)} \frac{\partial m(1, \frac{\tilde{V}_h}{N_h})}{\partial \tilde{V}_h}](w_h - p_l + SC) - e'(\widetilde{z})} \tag{7}$$

$$\triangle \tilde{V}_h = \triangle \widetilde{z} \frac{-\frac{\partial}{\partial \widetilde{z}} m(\frac{N_h}{\tilde{V}_h}, 1)}{\frac{\partial}{\partial \tilde{V}_h} m(\frac{N_h}{\tilde{V}_h}, 1)} \tag{8}$$

Now, in the formula for $\frac{\triangle \widetilde{z}}{\triangle SC}$, the terms with $\frac{\partial m(1, \frac{\tilde{V}_h}{N_h})}{\partial \widetilde{z}}$ and $e'(\widetilde{z})$ are both positive, which shows that $\frac{\triangle \widetilde{z}}{\triangle SC} > 0$. The feedback-effect via the negative term $\frac{-\frac{\partial}{\partial \widetilde{z}} m(\frac{N_h}{\tilde{V}_h}, 1)}{\frac{\partial}{\partial \tilde{V}_h} m(\frac{N_h}{\tilde{V}_h}, 1)} \frac{\partial m(1, \frac{\tilde{V}_h}{N_h})}{\partial \tilde{V}_h}$ then increases $\frac{\triangle \widetilde{z}}{\triangle SC}$ again. ■

The analysis also shows how the first-order effect of the increased profitability of education with the advent of the outside option is amplified by the second-order effect of the increased number of vacancies that firms provide as a reaction to the increase in the number of applicants. It embodies the matching externality.

4 Some empirical evidence

The main prediction that our model generates is that lower start-up costs increase the number of individuals opting to become educated.

As an empirical indicator of such human capital formation we use data on educational enrolment from the UN World Development Indicators. These are available for a large cross-section of countries. Data on start-up costs come from two different sources: the Global Competitiveness Report (Porter et al. (2000)) and Djankov et al. (2002). In the Global Competitiveness Report executives in different countries were asked 'whether venture capital was easy to get'.[6] Djankov et al. (2002) constructed an international

[6] Venture capital in our model makes it easier for educated individuals to set up their own firm. The main role of venture capital in the literature is to lower c_h, i.e. to make it

database that quantified the regulation of entry of new firms. They went to considerable lengths to collect national information on the costs of starting a new firm, including the number of procedures, and the time and cost of obtaining legal status. They not only checked the available written information but also contacted the relevant government agencies in the countries and commissioned independent reports on entry regulation from local law firms as well. Both the venture capital data and the regulation of entry data exist only for the year 1999.

Figure 1 of the Introduction showed the relation between the 'ease in obtaining venture capital' and tertiary school enrolment for 58 countries. These indicators show a very high correlation of 0.69. Likewise, the variable 'log(days to obtain legal status)' shows a very significant negative correlation with tertiary enrolment for 83 countries[7] - see Figure 2. Very similar relations are obtained for secondary school enrolment rates.[8]

Table 1 shows correlations between our two schooling indicators and four different indicators for start-up costs: the venture capital indicator, time needed to get legal status, costs associated with obtaining legal status and the number of procedures which are necessary to start a firm. All of these indicators are highly correlated with each other and with school enrolment.

Looking beyond simple correlations, we now try to explain school enrolment E_i using more variables. The included variables are an indicator for start-up costs or venture capital (VEN_i) and some control variables: GDP per head (Y_i), total public spending on education (PUB_i)[9], the illiteracy rate of adult males (IL_i), the unemployment rate of youths (U_i), and an indicator

easier for existing firms to create high-skilled vacancies such as via the financing of R&D activities of old firms.

[7]The countries in the samples are: Argentina, Armenia, Australia, Austria, Belgium, Bourkina Faso, Bulgaria, Bolivia, Brazil, Canada, Chile, China, Colombia, Croatia, Czech Rep., Denmark, Dominican Rep., Egypt, Finland, France, Georgia, Germany, Ghana, Greece, Hungary, India, Indonesia, Ireland, Israel, Italy, Japan, Jordan, Kenya, Korea, Latvia, Lebanon, Lithuania, Madagascar, Malaysisa, Mali, Mexico, Mongolia, Morocco, Mozambique, Netherlands, New Zealand, Nigeria, Norway, Pakistan, Panama, Peru, Philippines, Poland, Portugal, Romania, Russia, Senegal, Singapore, Slovak Rep., Slovenia, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Tanzania, Thailand, Tunisia, Turkey, Uganda, Ucraine, UK, US, Uruguay, Venezuela, Vietnam, Zambia and Zimbabwe.

[8]Enrollment rates are gross enrollment rates; i.e. the number of students divided by the relevant population, which might result in enrollment rates of more than 100% for secondary education.

[9]See e.g. Winter-Ebmer and Wirz (2002) for the relation between pubic funding and enrolment into higher education in Europe.

for the share of urban population in the country (URB_i). It can be argued that all of these variables influence school enrolment directly. The illiteracy rate of adults takes account of the intergenerational correlation in education enrolment which is well documented in the literature (Solon, 1999); the unemployment rate of youths can be seen as an indicator of the opportunity costs of youth while deciding about further education; a higher share of the population living in urban centers indicates both a general level of development and the availability of schooling institutions. Table 6 in the Appendix shows descriptive statistics for all the variables used in the analysis.

OLS results for tertiary enrolment are in Table 2 whilst those for secondary enrolment are found in Table 3. In both tables we experiment with the four different indicators for start-up regulation or venture capital shown above. The results are remarkably similar across specifications. Our indicators for start-up regulation always have the right sign and are statistically significant most of the time. The assessment by executives if 'venture capital is easy to get' varies in the data between a low of 1.9 and a high of 6.4. Increasing this assessment by one standard deviation (1.05) would increase tertiary enrolment by almost seven percentage points. The quantitative effect of registration time is somewhat smaller: decreasing the time necessary to obtain legal status by one standard deviation of our data set (60 percent) would increase enrolment by 3.6 percentage points. The effects of the other variables always have the anticipated sign, but lack statistical significance in many cases; only the coefficient of GDP is always statistically significant.

4.1 Robustness analysis

One potential problem with these results is the possibility of missing confounding variables or the endogeneity of start-up costs. It could be the case that both school enrolment as well as start-up regulation are caused by third factors like the climate towards entrepreneurship. As an attempt to deal with such problems, we instrument start-up costs by political variables which we assume to affect start-up costs directly but school enrolment only indirectly. The essential reason for this is that political choices can almost immediately affect start-up costs, but not directly education enrolment: in the short-run, enrolment levels are the result of the choices made by students and not government which makes the effect of political decisions indirect in the short run at least. As our instruments we use data on the political system from Botero

et al. (2003) and Djankov et al. (2002).[10]

Tables 4 and 5 report our estimates for the different start-up indicators. To test for the relevance of our instruments, we include indicators for the goodness of fit of the first-stage regressions, i.e. the marginal R^2 and the F-Test for the excluded instruments. The explanatory power of the instruments is quite good, though less so for the venture capital indicator.[11] The coefficients for the start-up costs in the IV specification are fairly similar to the OLS results. The coefficients are of comparable size and six out the eight relevant coefficients are statistically significant at the 10 percent level. It has to be said, though, that the null hypothesis that all instruments are orthogonal to the error term in the second stage (the Sargan-test for overidentification) fails in some cases, especially for secondary school enrolment. The results for secondary school enrolment should therefore be interpreted with care.

5 Conclusions and discussion

The present paper attempts to shed new light on the discussion about start-up costs for new firms. Whereas the standard argument in favour of lower start-up costs is that mismatched workers can then start their own firm, we argue that lower start-up costs also provide incentives for education. This is because new firms (at least those with expansive potential) are often set up by high-skilled workers. Lower start-up costs therefore not only increase production but also lead to a higher proportion of individuals choosing high-skilled education. In the presence of search frictions this improvement in the skill-composition of the labour force can furthermore increase the number of high-skilled vacancies. A corollary is that incumbent firms - who are supposed to lose in general from increased competition - can also gain from reduced start-up costs via the skill-composition effect that reduces the tightness of the job-market for high-skilled labor.

[10] These include: 1) Party affilliation: the percentage of years between 1975 and 1995 during which the party of the chief executive and the largest party in congress had leftist orientation; 2) Indicators for the origin of the legal system; 3) An indicator for autocracy indicating the 'general closedness of political institutions'; and 4) an indicator for property rights.

[11] This might be due to the fact, that - while the venture capital indicator relates to the financial infrastructure of the country - the other three indicators are related to legal circumstances which are more responsive to political and legal factors.

The empirical evidence on the effects of start-up costs on enrolment, which bears the usual caveats of being qualitative and available for few periods, strongly supports our model. Increasing the assessment of managers as to the ease with which venture capital is available by one standard deviation would increase tertiary enrolment by almost seven percentage points. Decreasing the time necessary for a new firm to obtain legal status by one standard deviation would increase enrolment by 3.6 percentage points.

Our results, if accepted, also reflect upon the discussion of whether education actually provides skills or just a signal of ex-ante existing skills. The present theoretical model assumes that education improves the skill level of a worker and has no signalling function. In a signalling model of education, workers need to provide the education certificate to signal their quality; no such signal is needed to be your own boss. Lower start-up costs in a signaling context would therefore reduce the incentive for (ex-ante) high-potential individuals to invest in the signal. Then, empirical evidence should reveal that lower set-up costs lead to lower tertiary education rates. The presented empirical evidence strongly suggests otherwise and hence supports the theory that at least some skill acquisition takes place during education.

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Appendix: Tables

Table 1: Correlation between Start-Up Indicators and School Enrolment

	Venture capital	ln(time)	ln(cost)	ln(steps)	Sec. enrolment	Tert. enrolment
Venture capital easy to get	1.0					
Ln (time to get legal status)	-0.60	1.0				
Ln (cost to get legal status)	-0.56	0.62	1.0			
Ln (number of steps to get legal status)	-0.64	0.83	0.64	1.0		
Secondary School enrolment rate	0.68	-0.50	-0.60	-0.47	1.0	
Tertiary School enrolment rate	0.69	-0.55	-0.60	-0.46	0.82	1.0

Correlations including venture capital relate to 53 observations, all others to 82 observations.

Table 2: Tertiary School Enrolment

	(1)	(2)	(3)	(4)
Venture capital easy to get	6.953			
	(2.721)*			
Ln (time to obtain legal status)		-4.760		
		(1.707)**		
Ln (cost to obtain legal staus)			-2.315	
			(1.319)	
Ln (number of steps to obtain legal status)				-4.727
				(3.141)
Unemployment rate youths	0.219	0.195	0.186	0.165
	(0.184)	(0.121)	(0.132)	(0.124)
Illiteracy rate male adults	-0.233	-0.120	-0.073	-0.106
	(0.155)	(0.085)	(0.091)	(0.088)
Public expenses for education	0.847	1.218	1.155	1.195
	(1.076)	(0.763)	(0.815)	(0.818)
Ln (gdp per head)	5.711	7.192	7.485	7.743
	(2.562)*	(1.351)**	(1.429)**	(1.400)**
% urban population	0.121	0.142	0.137	0.152
	(0.138)	(0.095)	(0.098)	(0.099)
Observations	53	83	82	83
Adjusted R^2	0.60	0.70	0.68	0.68

Standard errors in parentheses, * significant at 5%; ** significant at 1%

Table 3: Secondary School Enrolment

	(1)	(2)	(3)	(4)
Venture capital easy to get	9.765			
	(4.148)*			
Ln (time to obtain legal status)		-5.948		
		(2.864)*		
Ln (cost to obtain legal status)			-4.292	
			(2.137)*	
Ln (number of steps to obtain legal status)				-9.130
				(5.131)
Unemployment rate youths	0.573	0.368	0.446	0.346
	(0.280)*	(0.203)	(0.214)*	(0.203)
Illiteracy rate male adults	-0.137	-0.359	-0.252	-0.346
	(0.237)	(0.143)*	(0.148)	(0.144)*
Public expenses for education	1.000	2.280	1.893	1.994
	(1.641)	(1.281)	(1.321)	(1.336)
Ln (gdp per head)	8.439	11.819	11.519	12.019
	(3.906)*	(2.268)**	(2.316)**	(2.287)**
% urban population	-0.000	0.143	0.136	0.168
	(0.210)	(0.159)	(0.159)	(0.161)
Observations	53	83	82	83
Adjusted R^2	0.54	0.68	0.66	0.67

Standard errors in parentheses, * significant at 5%; ** significant at 1%

Table 4: Tertiary School Enrolment – IV estimates

	(1)	(2)	(3)	(4)
Venture capital easy to get	7.161			
	(3.977)			
Ln (time to obtain legal status)		-5.085		
		(2.024)*		
Ln (cost to obtain legal status)			-5.002	
			(2.248)*	
Ln (number of steps to obtain legal status)				-7.422
				(3.774)*
Observations	51	77	78	78
Marginal R^2	0.40	0.37	0.46	0.57
F-test	1.49	2.35	3.54	5.50
Sargan overid	24.82	13.43	17.58	17.07
prob >chi^2	0.02	0.42	0.17	0.20

Other variables as in Tables 2 and 3, standard errors in parentheses
* significant at 5%; ** significant at 1%

Table 5: Secondary School Enrolment – IV estimates

	(1)	(2)	(3)	(4)
Venture capital easy to get	1.331			
	(6.582)			
Ln (time to obtain legal status)		-9.450		
		(3.344)**		
Ln (cost to obtain legal status)			-4.823	
			(3.878)	
Ln (number of steps to obtain legal status)				-14.044
				(6.293)*
Observations	51	77	78	78
Marginal R^2	0.40	0.37	0.46	0.57
F-test	1.49	2.35	3.54	5.50
Sargan overid	22.26	24.18	21.40	17.78
prob >chi^2	0.05	0.03	0.05	0.16

Other variables as in Tables 2 and 3, standard errors in parentheses
* significant at 5%; ** significant at 1%

Table 6: Descriptive statistics and data sources

	Source	Mean	Standard Dev.
Tertiary enrolment rate	WDI	31.62	21.68
Secondary enrolment rate	WDI	78.73	34.97
Easyness of venture capital	Porter et al.	3.96	1.03
Cost of obtaining legal status, log	Djankov et al.	-1.57	1.36
Time to obtain legal status, log	Djankov et al.	3.58	.91
# of procedures to obtain legal status, log	Djankov et al.	2.24	.51
Youth unemployment rate (15-24 years)	WDI	17.69	10.64
Illiteracy rate total adult males	WDI	14.03	16.31
Public spending on education as a % of GDP	WDI	4.48	1.86
GDP per capita, log	WDI	7.98	1.63
Urban population, % of total	WDI	62.22	21.15
Chief executive‘s party has left orientation 1975-1995	Botero et al.	.50	.37
Chief executive‘s party has center-left orientation 1975-1995	Botero et al.	.640	.37
Largest party in congress has left orientation 1975-1995	Botero et al.	.557	.39
Largest party in congress has center-left orientation 1975-1995	Botero et al.	.684	.36
Legal origin, French	Djankov et al.	.397	.49
Legal origin, Socialist	Djankov et al.	.217	.41
Legal origin, Scandinavian	Djankov et al.	.051	.22
Legal origin, English	Djankov et al.	.269	.44
Autocracy: general closedness of political institutions between 1945 and 1998, 0 lowest and 10 highest	Djankov et al.	3.408	2.60
Property Rights, Index (0-1)	Djankov et al.	.663	.24