Allocating Matching Grants for Private Investments to Maximize Jobs Impacts

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Abstract: *Matching grants are frequently used to promote investments by small and medium-sized enterprises (SMEs) in private sector development programs supported by IFIs, such as business plan competitions. Participating firms are eligible to receive grants to fund part of the cost of their project or business plan. The selection criteria are usually based on the robustness of the project, as captured by its financial rate of return. This implies that projects with high rates of return may be chosen to receive grants, regardless of their impact on jobs. But when (as is often the case in low income countries, LICs) the wage rates paid by firms exceed the opportunity cost of labor; or when there are social gains linked to the creation of better jobs for some classes of worker (such as women or youth), there will be jobs-linked externalities (JLEs). These are not reflected in firms' financial rates of return, but they should be taken into account to optimize the allocation of investments. This market failure helps to explain why LICs often report disappointing rates of jobs growth, even when GDP is rising. In this paper, we show that JLEs are present, the optimal strategy is to select projects based on the amount of JLEs they generate per dollar of subsidy. We also argue that the grant ratio should not be fixed ex-ante or be the same for all projects. Rather, the optimal strategy is to ask participants to reveal the level of the matching grant they need to make their project feasible. The proposed selection mechanism maximizes the jobs impacts of the fiscal envelope available to fund the program.*

Keywords: Economic analysis, social rates of return, economic rates of return, cost-benefit analysis, entrepreneurship, social externalities, job creation, matching grants

JEL codes: J38, D61, D62, L26, O22

Introduction

In many developing countries, sound macro fundamentals and improved business environments have accelerated GDP growth, but have not led to significant structural transformations in the distribution of jobs. This is especially clear in Sub-Saharan Africa, where most of the workforce remains self-employed, either as farmers or own account workers in small household enterprises. Most workers engage in very low-productivity, predominantly rural, occupations - often without pay. (World Bank 2014, World Bank 2016, Merotto 2017).

Part of the problem might be the existence of *Jobs Linked Externalities* (JLEs). JLEs have two dimensions: (a) the difference between the market wage and the economic opportunity cost of the workers who get the jobs, which is called the *labor externality*[1] (LE); and (b) the social value that the jobs generate, such as the positive impact on child welfare of better jobs for women; and the impact on social stability of better jobs for young men. This is called a *social externality* (SE).[2] Firms making investment decisions usually do not consider these jobs-linked externalities. As a result, where JLEs are large, the level and distribution of investments across economic activities might be socially sub-optimal. For instance, there can be too little investment in relatively labor intensive projects or in activities that create jobs with high social externalities.

These jobs-linked externalities may help explain the often turgid pace of structural transformation of labor markets in many low-income countries (LICs) and can justify corrective

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[1] This term and concept is based on Jenkins, Kuo, and Harbeger (2011). See Robalino and Walker (2017) for an extensive discussion. The empirical estimation of labor externalities is relatively straightforward. It requires a measure of the earnings of workers in the new job and a credible estimate of the earnings that would have prevailed in the absence of the new job. The latter can be taken, ex-ante, from labor market data on earnings and employment rates for the corresponding class of worker in the relevant labor market. This can be verified ex-post, using impact evaluation techniques, if a credible control-group (of similar workers who do not get enhanced jobs) can be identified.

[2] There is growing evidence regarding the positive social effects of jobs (i.e., beyond the private income gains for workers and their employers). They include: reduced crime, violence, and conflict; improved health outcomes and education for the earner's children; and spill-overs from human capital developed at work, inter alia. Recent research from low income-settings in the OECD provides evidence of mothers' employment affecting preschoolers' behavioral and cognitive outcomes in the US (Baydar and Brooks 1991); evidence that unemployment increases right wing extremist crime in Germany (Falk, Kuhn, and Zweimuller 2011); evidence that summer jobs reduce violence among disadvantaged youth in the USA (Heller 2014); and evidence that youth unemployment leads to an increase in drug offenses, property crime, and theft in France (Fougere, Denis, Francis Kramza, Julien Pouget 2009). There is also evidence of such effects in LICs. Jensen (2012) found that a recruiting service for young women in Indian villages increased employment levels and school attendance, and improved post-school training and fertility decisions. The empirical estimation of the value of social externalities linked to jobs, unfortunately, is not straightforward. Policymakers may prefer to define a social preference function, which reflects the likelihood of the existence of the externality based on a reading of the literature and assigns an approximate value congruent with estimates made in rigorous studies. The assigned value can take the form of a multiplier, which is applied to the labor externality when the person who gets a job belongs to a demographic class whose employment is considered likely to generate social benefits, such as young people, women or those living in conflict zones. A recent study using a discrete choice survey in Palestine suggests that, on average, individuals are willing to pay to subsidize part of the cost of a job for vulnerable workers, particularly, youth and women (Mousley et al, forthcoming).

public policies to better align firms' incentives with countries' development objectives and resulting needs in terms of job creation.

Unfortunately, public policies to improve jobs outcomes have often focused solely on "supply-side" interventions such as skill training, job search assistance, and/or wage subsidies, known generically as Active Labor Market Programs (ALMPs). Yet, there is growing evidence that even well-designed supply-side programs often produce only small improvements in labor market outcomes (see Kluve et al., 2016, McKenzie 2017, Crepon and Van den Berg 2016, Fox and Kaul 2017). The likely reason is that it is difficult to connect workers to jobs or help them transition into better jobs if the demand for labor is not growing. Even if workers who benefit from training and intermediation programs get better jobs, they may just be displacing someone else, but evaluation studies rarely pick-up such "general equilibrium" effects. Although theory predicts that improving labor supply should lead, *ceteris paribus*, to some expansion in investment, it may not by itself be sufficient to offset the constraints that affect private investment and to address, explicitly, the JLEs discussed above. While reducing the cost of labor through subsidized training and wage subsidies can help address the market failures linked to the demand for training, they do nothing to address the market failure linked to JLEs. Internalizing JLEs requires subsidizing those investments with significant gaps between expected private rates of return and social rates of return that are attributable to expected jobs impacts. Instead of second-guessing entrepreneurs by reducing the cost of some of the inputs in the production function – such as different types of human capital – an investment subsidy allows the entrepreneur to allocate the transfers as needed, as long as the project improves jobs outcomes.

The limited impact of "supply-side" interventions have generated growing interest in "demand-side" interventions. There are different ways to subsidize private investments, such as value chain development programs and SMEs/entrepreneurship support programs, including business plan competitions to allocate matching grants. All these interventions, in the end, are a form of investment subsidy. But, although job creation is usually an explicit goal of such programs, their design generally focuses on correcting market failures *other than JLEs*, such as failures in capital and credit markets, coordination failures, and knowledge spillovers (see Hausmann,Rodrik, and Velasco 2006). One of the implications is that the firms that benefit from the programs are seldom selected as a function of the number and types of jobs their businesses are likely to generate. Financial considerations, output and productivity are the metrics that tend to dominate the selection process. But as discussed above, maximizing productivity, rates of return, and output doesn't necessarily lead to socially efficient jobs outcomes.

In this paper we analyze alternative criteria that might be used to select the firms and projects who are beneficiaries of demand-side interventions, based on variations in rules for allotting matching grants in a business plan competition. We show that in the presence of jobs linked externalities, projects should be ranked on the basis of the level of the jobs linked externalities they generate per dollar of subsidy. We also show that it is important to ask participants in the programs to reveal the level of the matching grant the require; the matching grant should not be fixed *ex-ante* and be the same for all projects. We show that, given the available fiscal envelope, the proposed selection mechanism equates private and social benefits, maximizes the number of jobs created, and has the largest impact on unemployment and underemployment rates.

The reminder of the paper is organized in four sections. Section 2 presents a brief review of criteria that have been used to select the beneficiaries of demand-side interventions. Section 3 develops a simple model that we use to show the difference between private and social rates of return in the presence of JLEs and to derive the optimal allocation rule for matching grants. Section 4 uses the model, with a specified production function and two-types of labor (skilled and unskilled), to simulate the potential impact of alternative matching-grant allocation criteria on output, labor productivity, and the number and types of jobs created. Finally, Section 5 discusses the main results of the paper and suggest an agenda for future research and policy analysis.

1. Selection Criteria for Beneficiaries of "Demand-Side" Programs

Often, the beneficiaries of demand-side programs are selected, subject to the *size* of the firm, on first-come-first-serve basis. Thus, many programs focus on small and medium size enterprises (SMEs), based on the premise that they are more labor intensive. However, the evidence on the relationship between firm size and job creations is mixed. Ayyagari, Demirguc-Kunt, and Maksimovic (2011) show that small firms (<20 employees) have the smallest share of aggregate employment, but account for the largest share of job creation. But Page and Soderbom (2015), using enterprise survey data from nine African countries, find that small and large formal sector firms create similar numbers of net jobs. They also find that small firms have higher labor turnover and offer lower wages (reflecting lower productivity). In the case of medium and large enterprises, a meta-analysis of the literature on Gazelles[3] shows that these enterprises generate a disproportionately large share of all new net jobs compared with non-high-growth firms (Henkerson and Johansson, 2010). In all studies covered, Gazelles generated a larger share of all of the net jobs and were the younger firms. However, the evidence about the relative size of Gazelles was ambiguous.

Beyond focusing on firm-size, little work has been done to incorporate jobs metrics into the design and evaluation of demand side interventions. In business plan competitions, proposals tend to be evaluated based on corporate metrics, such as projected output growth and financial profitability. A recent review of the World Bank's portfolio of matching grant projects, found that only 27 of 106 projects used the number of jobs as a results indicator and 80 of them selected beneficiaries on a first-come, first-serve basis (Hristova and Coste, 2016).

Cho and Honorati (2013) undertook a meta-analysis of impact evaluations of entrepreneurship programs in developing countries. They found that targeted outcomes typically focused on entrepreneur's income and/or improvements in business management practices. Outcome

[3] In the study a Gazelle was defined as "business establishment which has achieved a minimum of 20% sales growth each year over the interval, starting from a base-year revenue of at least $100,000"

indicators such as number of jobs created, and workers' earnings were less common.[4] Similarly, Grimm and Pauffhausen (2014) reviewed evaluations of programs supporting micro-entrepreneurs and SMEs and found that the focus on job creation was limited.

An intervention that introduced jobs as an important outcome in the selection criteria is the large-scale YouWiN! business plan competition in Nigeria, where winners received grants of approximately US$50,000, with a randomized treatment (see McKenzie, 2017). Winners were selected based on their scores for applicants' understanding of the industry and its market potential, plus data on travel time to the market, projected job creation, financial viability, financing sources, financing sustainability, managerial ability and a risk assessment. Job creation potential had the highest weight (earning up to 25 points out of 100). The study found that firms that received funding had a 20% higher likelihood of having ten or more workers three years after the support was given. [5]

A general challenge when selecting beneficiaries is to be able to predict business outcomes, including in terms of job creation. Most studies looking at this issue take place in high-income countries and deal with start-ups. Although several initiatives have been successful in predicting performance, they have usually focused on outcomes such as successfully launching a business or generating a revenue stream; not job creation (see Feind et al 2001, Scott et al 2016). Astebro and Elhedhli (2013), for instance, investigated the heuristics used by experts scoring proposals on 37 factors to predict successfully launching a business, and found a prediction accuracy of 80%.[6] A related, but distinct, literature studies the characteristics of successful entrepreneurs. This includes studies such as Nikolova et al. (2012), which uses household survey data to identify the characteristics of entrepreneurs who self-report having succeeded in starting a business. They found that some of the most important factors were individual income and social capital.

Two recent studies of business plan competitions in developing countries have shown that it is possible to predict employment outcomes, at least to some degree. Fafchamps and Woodruff (2016) analyze a business plan competition in Ghana and find that scoring by expert panels and scoring based on survey responses both have predictive power for employment, revenues, and profits. Combining expert panel scores and baseline survey data generated the most accurate predictions (i.e. expert judgements add value). McKenzie and Sansone (2017) analyze alternative prediction criteria for the YouWiN! business plan competition in Nigeria discussed above. Their paper tests predictions of employment, business survival, profits and sales using various

[4] Kluve 2016b shows that in a review of entrepreneurship programs the number of impact evaluations that tracked business performance outcomes was negligible.

[5] There have been other impact evaluations of business plan competitions for high growth potential entrepreneurs. Klinger and Schundeln (2011) evaluate a Technoserve program in El Salvador, Guatemala, and Nicaragua which awarded around US$9,000 to winners after multiple rounds of scoring and training. However, they were not able to measure jobs impacts. Fafchamps and Quinn (2017) conducted an evaluation of business plan competitions in Ethiopia, Tanzania, and Zambia that awarded substantially smaller grants (US$1,000) that would not suffice to impact an SME's job creation outcomes.

[6] Accuracy measures the number of proposals whose business outcomes were predicted correctly.

methods, including the business plan scores used in the competition, predictive regressions of outcomes on expert-selected characteristics, and machine learning algorithms.

It is noteworthy that these models do better analyzing the variation of employment than other outcomes (Table 1). Fafchamps and Woodruff (2016) show that it is possible to explain the variance in employment quite well (r^2 0.46), but their model explains little of the variance in investment, profits and sales. McKenzie and Sansone (2017) find that baseline data explain little of the future variance in employment (r^2 of 0.057) or profits (r^2 of 0.02), and predictions made incorporating human judgement (not reported here) do little better. The better predictive performance in Fafchamps and Woodruff's data may reflect the fact that the firms in their competition were mature (9 years old on average), which made possible the use of their historical data.

Table 1. Variation of firms' outcomes explained by regressions on baseline data in two recent studies of developing country business plan competitions

		Employment	Profits	Revenue	Investment
Fafchamps and Woodruff (2016)	R-Squared	0.464	0.14	0.231	0.201
	Obs.	229	221	224	229
McKenzie and Sansone (2017)	(Adj.) R-Squared	0.057	0.02		
	Obs.	1,062	1047		

Note: prediction using proxies for entrepreneurship ability, credit, management, and attitudes towards growth and control. Estimates for Fafchamps and Woodruff (2016) taken from Table 2 and for McKenzie and Sansone(2017) taken from Table 3.

In summary, selecting the right beneficiaries of demand-side interventions remains a challenge. There are two different problems: having the right development objectives guiding the design of the program; and having the right set of indicators to select beneficiaries and increase the likelihood of achieving these development objectives. Regarding the first problem, it is clear that most of the existing programs do not give enough attention to jobs outcomes, which are likely to be critical to maximizing development impacts in the presence of jobs linked externalities. In terms of the second problem, finding a combination of indicators that are able to predict success and reduce risks is not easy. Combining direct information about the business and the entrepreneur with the opinion of experts seems to be the most promising option. At the minimum, it seems important to separate vocational entrepreneurs from subsistence entrepreneurs. Once the variables/dimensions that predict the success of a business have been identified, it seems desirable to give preference to businesses that are likely to be more effective at improving jobs outcomes. In the next section we suggest a criterion that can be used in the presence of jobs linked externalities.

2. Efficient Allocation of Matching Grants in the Presence of Jobs-Linked Externalities

In the simple, two-period, model presented in this section, we assume that any investment project[7] eligible for a matching grant uses the funding to finance labor (L), at a set wage of w, and acquire capital (I) to produce goods and/or services (y) which are sold in the market at a price normalized to one. Each project has production characterized by its average productivity of labor employed (v) and capital per worker or production technology (i). For each project we therefore have:

$$y = vL, (1)$$

$$I = iL, (2)$$

The financial rate of return (R_f) of the investment is the share of profits in total costs:[8]

$$R_f = \frac{y - wL - I}{wL + I} = \frac{vL}{wL + iL} - 1 = \frac{v}{w + i} - 1, (3)$$

We use this expression to define a set of projects that have financial rate of return R_f^1, but different levels of average labor productivity and labor capital intensities, expressing it as the capital per worker:

$$i = \frac{v - w - R_f^1 w}{1 + R_f^1}, (4)$$

We observe that, given a level of investments (I), when labor productivity (v) increases, i needs to increase to preserve equality (4). This implies that the number of jobs created for an investment in capital of size I needs to decrease. Essentially, *a given amount of fixed-capital and a given financial return, may be associated with some projects which have high labor productivity and create few jobs; or with other projects with low labor productivity that create many jobs*.

Equation 4 also implies that, holding the level of labor productivity constant, an increase in the rate of return will reduce i and therefore increase the number of jobs created. Therefore, *for a given level of labor productivity (and fixed capital), projects with a higher rate of return are also projects that create more jobs.*

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[7] In this context and investment project can be either creating a new firm with start-up capital, or expanding production of an existing firm.

[8] The basic derivation of rate of return in a two-period model where the full investment (all costs) is made in period 0 and all benefits are paid out in period one is as follows:

$$NPV = 0 = \sum_{t=0}^{1} \frac{Gross\ Benefits_t - Costs_t}{(1+R)^t} = -Costs + \frac{Gross\ Benefits}{1+R}$$

Therefore $R = \frac{Gross\ Benefits}{Costs} - 1 = \frac{(Gross\ Benefits - Costs)}{Costs}$

To calculate the social rate of return of the project, we consider two types of jobs-linked externalities. First, the so-called, *labor externality* which is the difference between the total cost of labor and the opportunity cost of labor for the worker (i.e. foregone earnings). It is given by:

$$wL - wLe = wL(1-e), (5)$$

where e is the employment rate. In this simple model, e can also be interpreted as *the average adjustment in the salary*. This takes into account that not every worker in the project would be earning a salary exactly equal to w and that in the "without project" scenario their earnings also vary: some workers would be unemployed or underemployed and therefore earning little or no money, while others might have had better paying jobs.

The second jobs-linked externality is the *social externality*. This is defined as the additional social value of a job, which is not captured by the employer or the worker. Since some of those who could work in the project may already be employed, it is also necessary to discount the social externalities they are generating when calculating the social return of the project under consideration. Thus, the amount of social externality *attributable to the project* is the difference between the social externality associated with the labor in the project and that which was generated by those who were already working (i.e. the social opportunity cost). It is given by the expression:

$$SL - SLe = SL(1-e) \ (6)$$

where S captures the value of the externality per job.

The social rate of return (R_s) can thus be derived from equation (3) by adding the two jobs externalities to the numerator and correcting the denominator to adjust for the true opportunity cost of labor[9]. We have:

$$R_s = \frac{y - Lw + L(1-e)(w+S) -}{Le(w+S) + I} = \frac{v - w + (1-e)(w+S) - i}{e(w+S) + i}, (7)$$

As before, we define the set of projects with a same social rate of return R_s^1 which vary in their level of labor productivity and the capital per worker:

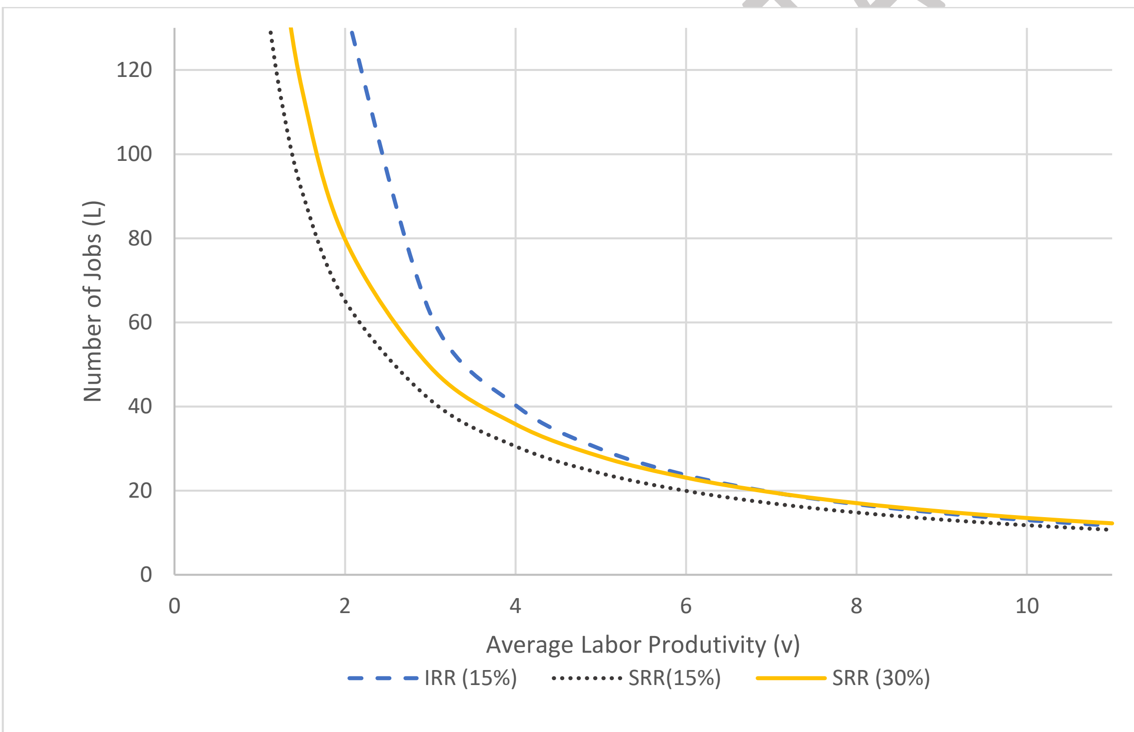
$$i = \frac{v + S - e(w+S)(1+R_s^1)}{1+R_s^1} = \ (8)$$

Plotting the isocurves defined by equations (4) and (8) for given levels of rate of return, we see that isocurves that take into consideration jobs-linked externalities lie below the isocurves with only financial returns and that both curves have decreasing L as v increases (see Figure 1). Thus, for a given capital per worker and a target rate of return, projects can have lower labor productivity when taking into account jobs externalities. Moreover, as per equations (4) and (8), all the isocurves move up as rates of return increase. At the same time, the isocurve for a social

[9] This is the foregone income and social externalities rather than the financial cost of labor.

rate of return equal to 30% lies below the isocurve for a financial rate of return equal to 15%. An important finding is that some firms with productivity levels (v) below a threshold will not be able to generate the curve's financial rate return value, no matter how many jobs they create, but will be able to generate a social rate of return of the same level. This is because equations (4) and (8) produce vertical asymptotes for both the financial and social rate of return curves that serve as lower bounds on productivity (v) and the productivity value of the financial rate of return curve's asymptote will always be greater than that for an isocurve that incorporates jobs-linked externalities (and yields the same return). This implies that some firms that have low productivity and very high job creation potential might not be considered in a matching scheme that sets a minimum threshold on the financial rate of return even if they have substantial social rates of return.

Figure 1: Financial and social rate of return isocurves



The curves correspond to the following set of model parameters $\{w = 1; s = 0.8; e = 0.5; I = 100\}$. The dotted line is based on equation (4) and maps the combinations of labor productivity (v) and number of jobs created (base on the value of i and equation (2)) that generate a rate of return of 15%. The orange curve is based on equation (8) and maps the combinations of labor productivity and jobs created that generate a rate of return of 30%. When social externalities are not taken into consideration and the minimum rate of return is set to 15%, all projects with labor/productivity combinations below the blue line would be excluded from the matching grants. Yet, we see that many of these projects have a social rate of return that is greater than 15%.

When a matching grant is introduced part of the cost of the investment project is subsidized and therefore the private rate of return increases. If we assume that investors pay a fraction m of the total costs of the project while the government finances the share $(1 - m)$, the private rate of return, R_p , is given by:

$$R_p = \frac{v - wm - im}{wm + im}, (9)$$

Hence, when $m = 1$ (i.e., there is no matching grant) $R_p = R_f$.

To calculate the optimal level of m we equate net private and social benefits (the numerators of equations 7 and 9).

$$v - w + (1 - e)(w + S) - i = v - m(w + i), (10)$$

The optimal level of m for each project is therefore given by:

$$m = \frac{w - (1 - e)(w + S) + i}{w + i}, (11)$$

We can then calculate the total cost for the government of subsidizing a given project:

$$C = \left(1 - \frac{w - (1 - e)(w + S) + i}{w + i}\right)(w + i)L, (12)$$

This implies that the optimal subsidy per job is given by:

$$c = (1 - e)(w + S), (13)$$

which is equal to the value of the externalities per job. Thus, given the wage rate, the subsidy increases when the social externality per job (s) increases and/or when the unemployment or underemployment rate increase. We note that the optimal subsidy per job doesn't depend on the level of labor productivity, the capital per worker, or the level of capital.

Allocating Matching Grants

In principle, if we have a fixed budget and the goal is to maximize allocations that capture jobs externalities, projects should be ranked by the level of the total jobs externalities they generate. Thus, projects that create a large number of jobs and/or that have a high level of externalities per job would receive priority. If the externalities per job (i.e., the optimal subsidy per job) are constant across projects, then projects could be simply ranked by the number of jobs they create. This would maximize both the social externalities that are internalized by the subsidy and the number of jobs created.

In reality, externalities will depend on the type of jobs created and who gets the jobs. The value of the externalities will vary across projects not only as a function of the number of jobs but also as a function of wages, the level of skills required, and the activity/employment status of those who get the job. For instance, projects that create jobs for inactive women or unemployed youth are like to generate, other things being equal, higher externalities than those that hire self-employed males.

Formally, the general formula for the value of the jobs externalities generated by project j can be written as:

$$E_j = \sum_h (1 - e_h)(w_h + s_h)L_{jh}\,, (14)$$

where h indexes the type of labor (e.g., by gender, age, and type of skills), as before e_h captures the average level of earnings of workers of type h, $L_{jh}$is the number of jobs of type h, created by the project.

The level of the matching grant will also vary across projects. Indeed, if the government sets the level of the matching grant, it should be proportional to the level of the jobs externalities. If, on the other hand, the matching grant is defined by the applicants to the program as part of their business proposals, they will likely have very different needs in terms of support. We can therefore define the level of the matching grant as:

$$M_j = \left(1 - m_j\right)\left(I_j + \sum_h w_h L_{jh}\right), (15)$$

Then, in order to maximize the impact of a fix mount of government subsidies on jobs, projects can be ranked by what we call the *externality-subsidy exchange rate* given by:

$$x_j = \frac{E_j}{M_j}, (16)$$

This ratio represents the level of the social externality that can be mobilized with one unit of subsidy. The higher the level of x_j, the higher the ranking of the project.

It is worth noting that the proposed allocation mechanism could have unintended consequences. Subsidies could end-up funding projects that would have been funded anyways (a death-weight loss) or program participants can try to game the system by inflating the number of jobs created. As discussed in the annex, however, these problems can be eliminated by 1) setting a cap on the financial rate of return of eligible projects; and 2) asking program participants to reveal in their business plan the level of the matching grant they require.

3. Simulation of Business Outcomes under Different Allocation Mechanisms

The purpose of this section is to illustrate, numerically, the impact that different criteria to select investment projects can have on business outcomes, particularly on the number of jobs created, the cost per job created, total output, and average labor productivity. To this end we adopt a more realistic production function that incorporates two types of labor: skilled (h) and unskilled (l). We assume that each project j is associated with a CES production function given by:

$$y_j = A_j\left[\alpha_j I_j^r + \left(1 - \alpha_j\right)\rho_j\left(\rho_j L_j\right)^r + \left(1 - \alpha_j\right)\left(1 - \rho_j\right)\left(\left(1 - \rho_j\right)L_j\right)^r\right]^{1/r}, (17)$$

where A represents total factor productivity (TFP), α is the share of capital, ρ is the share of skilled labor, and r is the elasticity of substitution.

In the simulations we treat all the parameters and variables of the production function, except for A, as uniform random variables (see Table 2). Thus, different projects create a different number of jobs of each type (skilled and unskilled) and use very different production technologies. We assume that the social externalities (s_h, s_l), market wages (w_h, w_l), and adjusted employment rates (e_h, e_l) for each type of labor are constant across projects. Total factor productivity is determined endogenously so that the following condition for profit maximization holds:

$$(1-\alpha_j)y_j = w_h\rho_j L_j + w_l(1-\rho_j)L_j, \quad (18)$$

This implies that total factor productivity is given by:

$$A_j = \frac{w_h\rho_j L_j + w_l(1-\rho_j)L_j}{\left[\alpha_j I_j^r + (1-\alpha_j)\rho_j(\rho_j L_j)^r + (1-\alpha_j)(1-\rho_j)\left((1-\rho_j)L_j\right)^r\right]^{1/r}} \frac{1}{(1-\alpha_j)}, \quad (19)$$

In our simulation of a business plan competition, virtual participants submit business plans expecting to receive matching grants (i.e., a subsidy) to pay for part of their project's investment costs. The information contained in each business plan includes: the amount of the investment; the share of subsidy requested $(1-m)$; the number of low and high skills jobs that will be created by the investment project; and the expected output.

Using this information, firms are ranked, based on seven different selection criteria: 1) the financial rate of return (FRR) of the project; 2) the social rate of return (SRR) of the project; 3) the difference between the SRR and the FRR which is essentially the value of the jobs externality per dollar invested (the denominator in this case is the total *economic* costs of the project; 4) the net financial benefits per dollar of subsidy (excludes the value of the jobs externalities); 5) the net financial and economic benefits per subsidy (includes the jobs externalities); 6) the value of jobs externalities per dollar of subsidy (our suggested measure as per the analysis presented in the previous section); and 7) first come, first served.

Table 2. Values and Uniform Distributions of Exogenous Parameters

Parameters	Description	Simulation specifications
s_h, s_l	Social externalities per type of job	(0,240)
w_h, w_l	Wages by type of job	(2000,4000)
e_h, e_l	Adjusted employment rates	(1, 0.6)
I_j	Total capital investment	[30,000; 190,000]
m_j	Matching proportion of investment requested by the firm and financed by the project	[5%; 50%]
i_j	Capital per worker	[1,000; 6,000]
r	Elasticity of substitution	[.2;.8]

α	Share of labor in production function	[.2;.8]
ρ	Share of high skilled labor	[.1;.9]

For each selection criteria we look at several outcome indicators including the number of jobs created by the virtual business competition, the average cost per job (includes capital and salaries), the average subsidy per job, average labor productivity, and the aggregate FRR and SRR of the program.

We simulate 500 business competitions each with a budget of USD 6 million. For each business competition we draw 5,000 projects and drop those projects that do not meet any of the following criteria: 1) have an FRR below 5% or greater than 35%; and/or 2) have a total cost (labor plus non-labor) above 200,000. The main results are presented in Tables 3 and 4. For each of the outcomes of interest we report the average and standard deviation across business competitions.

The first observation is that it is critical to take the level of matching grant (subsidy) associated with a project into account in the selection process. Selection criteria that adjust financial and/or economic benefits by the value of the subsidy required by the project (criteria 4, 5 and 6) are able, not surprisingly, to support a larger number of projects and therefore mobilize a larger amount of private capital. For instance, when selecting projects based on their FRR only an average of 166 projects are funded in each business competition. When adjusting outcomes by the level of the subsidy, the average number of projects funded surpasses 400 in each business competition. As a result, the average level of private capital mobilized increases from USD 22 million to over USD 57 million, and the average subsidy per project (the value of the matching grants) falls from USD 36,000 to 12,000-13,000 (see Table 3).

Table 3. Investment and subsidy amounts under each selection criterion

		Aggregate capital (million, USD)	Number of projects funded	Average subsidy per funded project (thousand, USD)
1. Net financial benefits per dollar invested (IRR)	mean	21.8	166	36,189
	sd	0.8	7	1,565
2. Net economic and social benefits per dollar invested (SRR)	mean	21.9	163	36,948
	sd	0.9	8	1,812
3. JLE per dollar invested (SRR-IRR)	mean	21.9	158	38,068
	sd	0.9	7	1,751
4. Net financial benefits per dollar of subsid	mean	61.0	464	12,941
	sd	1.1	9	262
5. Net economic and social benefits per dollar of subsidy	mean	63.9	486	12,358
	sd	1.1	9	240
6. JLE per dollar of subsidy	mean	57.4	435	13,789
	sd	1.2	10	314
7. First-come, First-serve	mean	21.9	166	36,118
	sd	0.8	7	1,570

Note: Except for IRR, dollars invested are valued at their economic costs. JLE=Jobs linked externality Aggregate capital refers to the total investment raised including the grants and amounts matched by projects. Based on 500 simulations.

By funding a larger number of projects, the selection criteria that take into account the value of the subsidy per project are also able to create a much larger number of jobs. Selecting projects based on their FRR creates the lowest number of jobs; around 3,700 per business plan competition with an average subsidy per job of USD 1,600. Selecting projects by their SRR or the difference between the SRR and FRR (which give more weight to jobs externalities) is better but still, the total number of jobs create per business plan competition is in the order of 5,000 with an average cost of 1,000-1,200 per job. Selection criteria 4, 5, and 6 almost double the number of jobs created and thus halve the cost per job created (see Table 4 columns 1 and 5).

However, there are substantial differences among these three selection criteria. Ranking projects based on the net financial benefits per dollar of subsidy generates the least number of jobs given that externalities are not taken into account; around 10,400 per competition at an average cost of USD 570. As the simple model developed in the previous section showed, ranking projects by the value of jobs related externalities per dollar of subsidy generates the maximum number of jobs with social externalities, which in our example are low skilled jobs. The total number of jobs created is a bit below that achieved by ranking projects by the net financial and economic benefits per dollar of subsidy; 11,400 vs. 11,500 at an average cost of USD 526 vs. 522. But given the standard errors these differences are not statistically significant.

Table 4. Jobs-related business competitions outcomes

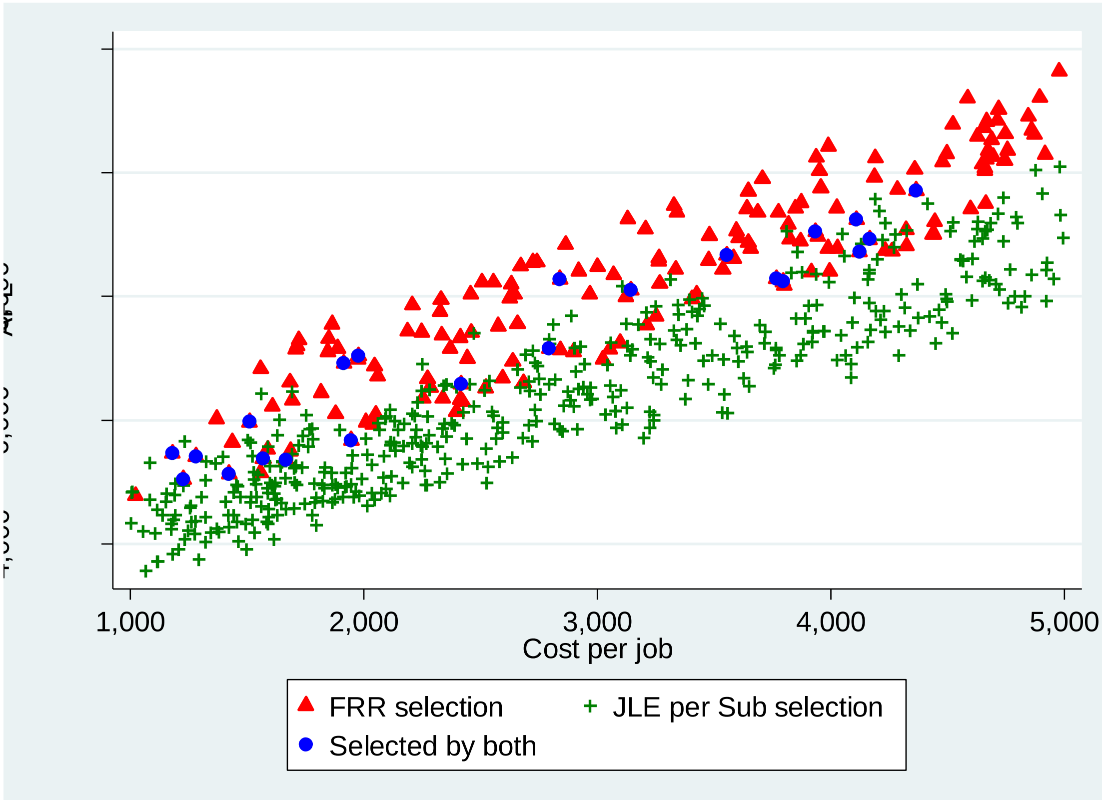
		Total jobs created	Jobs with social externalities	Aggregate value of JLEs	Average cost per job	Average subsidy per job	Productivity (output per job)	Aggregate SRR	Aggregate IRR
1. Net financial benefits per dollar invested (IRR)	mean	**3,743**	**1,971**	**1,765,750**	**5,826**	**1,606**	**7,813**	**45%**	**34%**
	sd	154	119	106,657	108	66	145	1%	0%
2. Net economic and social benefits per dollar invested (SRR)	mean	**4,971**	**3,928**	**3,519,646**	**4,404**	**1,209**	**5,751**	**53%**	**31%**
	sd	189	154	137,586	77	46	105	1%	0%
3. JLE per dollar invested (SRR-IRR)	mean	**5,678**	**4,727**	**4,235,007**	**3,855**	**1,058**	**4,577**	**44%**	**19%**
	sd	210	174	155,765	43	39	57	1%	1%
4. Net financial benefits per dollar of subsidy	mean	**10,456**	**5,504**	**4,931,521**	**5,833**	**574**	**7,326**	**36%**	**26%**
	sd	215	177	158,930	60	12	78	0%	0%
5. Net economic and social benefits per dollar of subsidy	mean	**11,501**	**6,801**	**6,094,039**	**5,555**	**522**	**6,867**	**36%**	**24%**
	sd	222	189	169,081	59	10	78	0%	0%
6. JLE per dollar of subsidy	mean	**11,416**	**8,113**	**7,269,472**	**5,032**	**526**	**5,975**	**35%**	**19%**
	sd	231	175	156,862	55	11	68	1%	0%
7. First-come, First-served	mean	**3,756**	**1,980**	**1,774,244**	**5,825**	**1,600**	**6,916**	**29%**	**19%**
	sd	156	116	104,374	110	66	137	1%	1%

Note: Except for IRR, dollars invested are valued at their economic costs. JLE=Jobs linked externality. Average cost per job is the total number of jobs created divided by aggregate total investment. Productivity is the total output by all supported firms divided by total number of jobs created. Aggregate SRR and IRR are equivalent to (investment) weighted averages across all funded firms. Based on 500 simulations.

Clearly, there are tradeoffs between choosing projects based on the level of jobs related externalities per dollar of subsidy, the financial rate of return, or even the net financial benefits per dollar of subsidy. Creating more jobs, particularly low skills jobs, implies favoring projects with more labor-intensive production technologies and a lower average labor productivity. Thus, while average labor productivity among projects with the highest FRR and the highest net financial benefit per dollar of subsidy is USD 7,800 and 7,300 respectively, it falls to USD 5,900 for projects selected on the basis of jobs externalities per subsidy. But this is precisely what the intervention is trying to achieve: correct a market failure (the presence of jobs externalities) that would lead to investments that maximize labor productivity and profits but fail to create enough jobs and reduce underemployment.

These tradeoffs are better captured in Figure 2 in the case of one of the business competition simulations. In the figure, the green cross marks represent projects that are selected when the criteria is the level of jobs externalities per dollar of subsidy, and the red triangles those selected based on their FRR (the blue dots are projects selected in both cases). We see that for any level of capital per job (horizontal axis) green projects have a lower average labor productivity than red projects. Green projects tend to be more labor intensive (they have lower capita per job) and generate less output (and profits) per job, but at the same time they benefit a larger population of underemployed workers.

Figure 2: Tradeoffs Between Capital per Job and Average Labor Productivity



4. Conclusion

The simple model and simulations presented in this paper suggest that traditional matching grant programs that offer fixed grant amounts to participants on a first come, first served basis, or based on the rate of return of the project are unlikely to maximize development impacts given a fiscal envelop. A competitive system where the level of the matching grant is part of the business proposal and the selection criteria is based on the level of jobs externalities generated per dollar of subsidy is likely to be a better approach. This indicator does not have to be exclusive. It is possible, and desirable, to add other dimensions to the selection criteria that reduce the risk of the project, such as the managerial skills of the applicant. But it is important to give sufficient weight to the jobs externality indicator.

Indeed, selecting the projects based on the level of the jobs linked externalities is critical to promote investments capable of reducing unemployment and underemployment rates. These are investments that are likely to require lower levels of capital per job (more labor-intensive technologies) and have lower levels of labor productivity. But this is precisely the goal of the selection criteria: correcting a market failure (the presence of jobs externalities) that would otherwise lead to investments that maximize labor productivity and profits but fail to have enough development impact.

Making the level of the matching grant part of the business proposal is important to reduce dead-weigh losses (the number of projects that would have been financed in the absence of the grant) and gaming (inflation in the number of jobs created). At the same time, taking into account the value of the subsidy per project is important to maximize the number of projects that can be served and the level of private capital that is leveraged.

While the focus of the paper has been on matching grants in the context of business competitions, the results are likely to be more general. Indeed, there are different government initiatives promoting private sector development through implicit or explicit subsidies such as value-chain development programs or SME support programs. All these programs involve making choices in terms of the values chains and/or businesses that need to receive support. The section criteria outlined here can be adapted to ensure that subsidies are allocated to those investment projects that maximize jobs impacts.

Clearly, challenges remain with the operationalization of the proposed selection criteria. The first challenge is achieving meaningful competition for the funds. Feasibility studies will need to evaluate the demand from potential participants, so project teams can choose eligibility criteria designed to ensure sufficient participation. In the Fafchamps and Woodruff (2016) business competition in Ghana there weren't enough applicants, even the pilot had indicated this would not pose a challenge. As discussed in Section 3 above, another challenge is to develop methods to be able to judge from firms' proposals whether businesses will be successful in generating improved jobs outcomes.

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Annex 1: Allocation Criteria and Firms' Incentives

This project selection criteria discussed in the main text has two potential problems: *deadweight losses* and *gaming*. Deadweight losses can occur if projects that would have been funded in the absence of subsidies end-up receiving a matching grant. This is likely to happen in the case of projects that have high private rates of return and also generate large externalities (i.e., they create many jobs). One solution to this problem would be to only fund projects which have a private rate of return below a given threshold, but this could exacerbate "gaming," as we discuss below.

Gaming occurs if the grants allocation rule gives incentives to entrepreneurs to arbitrarily reduce rates of return (in order to meet the threshold) and/or inflate the number of jobs (in order to receive more subsidies). We analyze each of these problems in turn.

Let's assume that the maximum private rate or return to receive grants is set at 5%. An entrepreneur whose project has a 15% rate of return (*blue* dot in Figure A1) could report a lower rate of return by reducing output and/or the number of jobs created.

Reducing output implies moving from the *blue* dot to the *green* dot, implicitly reducing the average productivity of labor and therefore profits. But lower profits can be justified by the matching grant. In essence, by moving to the *green* dot the entrepreneur would still achieve a higher rate of return on investments (after the subsidy). Indeed, at the *green* dot the isoquant for the social rate of return that intersects the isoquant for the private rate of return is above 15%. At the intersection of the two isoquants, the matching grant is "equating" the private and social rates of return (i.e., increasing the private rate of return to the level of the social rate of return). Hence, gaming to enter the scheme is possible. At the same time, this type of gaming can only occur if participants know the value of the jobs externalities and figure out the "shapes" of the isoquants.

The problem of inflating the number of jobs among eligible projects seems to be less of an issue. This would the case of a project represented by the *red* dot in Figure A1. The question is whether an entrepreneur would have incentives to move to, say, the *green* dot. Moving would imply reducing average labor productivity and ensuring that the additional workers can work. Without a change in the production technology (represented by i) this would require additional capital. If entrepreneurs are willing and able to mobilize more capital, then the matching grant is providing the right incentives: entrepreneurs would create more jobs, produce more output, and receive a larger amount of matching grants (even if average labor productivity declines). If, on the contrary, additional workers are simply idle the movement from the *red* to the *green* dot would represent a loss. Indeed, the subsidy per job is like to be always below the wage. Each worker that is hired without working would impose a cost that doesn't bring additional output or profits.

In conclusion, the proposed criteria to allocate grants, including having a maximum rate of return on private investments, seems to be robust to gaming, as long as a participants do not have information about the level of subsidies per job. In practice, having them define the level of the required matching grant as part of their business proposal is also likely to improve the efficiency of the selection process. Projects with a matching grant above the optimum would be discarded. The projects that remain can then be ranked by the level of the matching per jobs externality.

Figure A1: Incentives for Gaming