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ISSN: 2365-9793

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ABSTRACT

Allocating Subsidies for Private Investments to Maximize Jobs Impacts*

Governments often aim to influence the amount and sectoral allocation of private investments through explicit or implicit subsidies. The rules used to select projects to benefit from subsidies may vary, depending on the policy objective. This paper develops a general framework to allocate subsidies to private investments in the presence of jobs-linked externalities (JLEs). JLEs emerge when wages exceed the opportunity cost of labor (labor externalities), or when there are social gains from creating better jobs for some classes of worker, such as women or youth (social externalities). Like all externalities, JLEs create a gap between private and social rates of return. Investments can be socially profitable (once the corresponding JLEs are internalized) but the private returns may be too low for the firm to go ahead. JLEs help to explain why many developing countries see insufficient investment in projects that would reallocate labor towards better jobs. The concept of JLEs is well established in economic literature, but there is a need for better operational approaches to address them. Like other externalities, JLEs can be corrected using a variety of possible subsidies (such as: grants, subsidized infrastructure, credit, training, technical assistance and tax exemptions). But doing this efficiently and at scale this requires mechanisms to (a) estimate the value of the externality and (b) discover the amount of subsidy needed to trigger the private investment. This paper shows that the optimal way to allocate subsidies to offset JLEs is through a competitive bidding process which selects projects based on the estimated amount of JLEs per dollar of subsidy. The bidding process provides an incentive to investors to reveal the subsidy needed for a project to become privately viable. We show that the proposed approach maximizes the jobs impacts of a given amount of fiscal resources that has been allotted to support better jobs outcomes.

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

Keywords: economic analysis, jobs-linked externalities, labor externalities, social externalities, social rates of return, economic rates of return, cost-benefit analysis, entrepreneurship, job creation, investment subsidies, investment incentives, competitive bidding

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* The authors are grateful for comments from Chris Delgado, Marcello Estevao, David McKenzie, Martin Rama and Dani Rodrik and participants of the 2019 IZA/World Bank/NJD Conference on Jobs and Development on earlier versions of this paper.

Allocating Subsidies for Private Investments to Maximize Jobs Impacts

Introduction

In many developing countries, sound macroeconomic fundamentals and improved business environments have accelerated GDP growth, but they 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 2012, World Bank 2016, Merotto et al, 2019).

Part of the problem might be the existence of *Jobs Linked Externalities* (JLEs). The central argument of this paper is that in the presence of JLEs, the market-determined level and distribution of job-enhancing investments might be socially sub-optimal. For instance, there can be too little investment in relatively labor-intensive projects that enhance earnings for large numbers of workers; or in projects that create jobs with high social externalities. JLEs may help explain the turgid pace of labor market transformations in low-income countries (LICs) and justify corrective public policies to better align firms' incentives with development objectives in terms of job creation.[1]

Like other externalities, JLEs are a form of market failure. Firms making investment decisions usually do not take them into account, because the benefits correspond to the workers they hire, or to society at large, and not to the firm. The notion that the lack of good jobs is a market failure which merits the attention of policy makers is gaining traction. For example, Rodrik and Sabel (2019) argue that: "the shortfall in good jobs can be viewed as a massive market failure – a kind of gross economic malfunction (page 3)." They go on to argue that: "producing good jobs is a source of positive externality for society. From an economic standpoint, the issues are analogous to those that arise in the cases of environmental externalities or R&D externalities…A firm considers labor as a production input, with the market wage as its cost… When wages rise, either because of greater productivity or enhanced bargaining power of labor, firms try to economize on the use of labor... From a society's standpoint, the result is an undesirable trade-off between good jobs and the level of employment. Today's economies tend to manage this trade-off by allowing dualistic labor markets to become entrenched: islands of productive, high-wage activities exist in a sea of poor jobs" (page 4). Other recent papers that endorse the idea that the insufficient growth of better jobs in LIC settings is a form of market failure which calls for a policy response include Fields (2015); and (Carter and Plant, 2020). The latter argues that "in economies with widespread

[1] Of course, some jobs may also have negative externalities associated with them. That can happen, for example, due to abusive or dangerous working conditions (e.g. child labor). Even when the jobs are good jobs for the workers who have them, they may be associated with an activity that generates other, negative, social or environmental externalities (such as the unsustainable exploitation of renewable resources; or the generation of carbon emissions). Other jobs– such as so-called "Bullshit Jobs" (Graeber, 2018) may have little social utility. A full analysis of the public policy case for supporting any given investment project (and the associated jobs) should factor in all such considerations.

under-employment, good jobs are an externality to firms' investment decisions that could justify a subsidy". Policymakers are also increasingly concerned with this issue, motivating the IDA18 and 19 "Jobs and Economic Transformation (JET) special theme (World Bank, 2019 b).

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*[2] (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).

The concept of social gains from better jobs (beyond the private income gains for workers and their employers) is extensively discussed in the 2013 World Development Report on Jobs, (World Bank, 2012), which put forward the concept of "good jobs for development". When young men get better jobs in FCV settings the positive social effects of jobs may include reduced crime, violence, and conflict. When young women get better jobs in LIC settings, they can contribute to increased female labor force participation, delayed family formation, reduced fecundity and improved health and education outcomes for their children. Better jobs also lead to spillovers from the human capital acquired through on the job learning.[3]

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.

However, the empirical estimation of the value of *social externalities* linked to jobs is not so straightforward. One approach to estimating the value of social externalities is the use of stated preference (contingent valuation) techniques. A recent study using a discrete choice survey in Palestine suggests that, on average, tax-payers are willing to pay substantial amounts to subsidize jobs for vulnerable workers, particularly, youth and women (Mousley et al. forthcoming). 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 be operationalized in the form of a multiplier applied to the labor externality when the person who gets a job belongs to the corresponding demographic class (e.g. young women or youth in conflict zones).

[2] See Jenkins, Kuo and Harberger (2018). See also Robalino and Walker (2017) for an extensive discussion.

[3] There is growing evidence on these issues, much of it drawn from low income-settings in the OECD. For example: mothers' employment improves preschool children's behavioral and cognitive outcomes in the US (Baydar and Brooks 1991); unemployment increases right-wing extremist crime in Germany (Falk, Kuhn, and Zweimuller 2011); summer jobs reduce violence among disadvantaged youth in the US (Heller 2014); and youth unemployment leads to an increase in drug offenses, property crime, and theft in France (Fougere, Denis, Francis Kramza, and 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 and school attendance and improved post-school training and fertility decisions.

Unfortunately, public policies to improve jobs outcomes have often focused solely on "supply-side" labor market interventions such as skill training, job search assistance and/or wage subsidies, known generically as Active Labor Market Programs (ALMPs). Such programs address the well-known externalities (and other market failures) which reduce firms' and households' investments in human capital (education and training). But these are different from JLEs, which are linked to the creation of better jobs. So, while 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 associated with JLEs.

Consistent with this, there is growing evidence that even well-designed ALMP 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 enough to offset other constraints that affect private investment and to address, explicitly, the JLEs discussed above.

Another potential "supply side" point of entry for accelerating the creation of better jobs is the reform of poorly conceived public policies that may discourage job-creating investments in the formal sector by taxing the supply of labor (and thus increasing its cost). That can push workers into informal jobs, normally linked to small scale firms with limited capitalization and low productivity growth. The result is a vicious circle which undermines the growth of better jobs (Levy, 2008; Ribe Robalino and Walker, 2012). Examples include social protection systems that rely on payroll levies to finance health and income protection (the so-called "Bismarkian" system). The result is a "tax wedge" linked to the creation of formal jobs. To address this problem, a growing literature argues for universal health and social protection entitlements financed from the general taxation pool (e.g. drawing on sales taxes). This approach, which builds on the Beveridge reforms in post-WW2 UK, also has the advantage of breaking down the social apartheid of differentiated benefits for formal versus informal workers (World Bank, 2019).

There is also ample scope to review the design of labor codes to remove disincentives to formal job creation. For example, large severance-pay entitlements imposed on employers (but without creating effective rights for most workers) should be replaced by fair, transparent unemployment benefit systems. Similarly, when minimum wage levels are set too high, they may dampen demand for relatively low-skilled labor.

It is noteworthy that LICs that achieved rapid growth of better jobs in recent decades have usually avoided using public policies to accelerate the growth of formal sector labor costs. They have preferred to reach the "Lewis tipping point", when rural labor surpluses were exhausted and market forces accelerated formal sector income growth, as happened in China after 2006 (Merotto et al, 2020). However, the empirical evidence on the relationship of minimum wages to labor demand is indecisive (Betcherman, 2012) and reforming labor codes and social protection systems can be difficult, due to complex political economy issues.

The failure of “labor supply side” approaches to the jobs problem of LICs also suggests the limits to what might be achieved by a Pigouvian subsidy to the cost of labor. In the absence of viable projects that can use labor profitably, a shift in relative factor prices is unlikely to make much difference. The jobs challenge of LICs is not a static equilibrium problem around the optimal combination of labor and capital inputs, where the focus is on the *substitutability* of labor and capital. Rather, increased demand for labor is best seen as a *complement* to increased investment demand. The central problem is to accelerate investment in projects that can absorb under-utilized labor from the backwards sector of the economy, given market demand conditions and the characteristics of the available labor supply.

The limited impact of “supply-side” interventions has generated growing interest in “demand-side” interventions to accelerate firm growth and the creation of better jobs. The overall aim is to facilitate “capital deepening” by raising the capital-labor ratio of the economy. In LIC settings, increasing the investment rate (gross domestic capital formation) also facilitates the growth of “total factor productivity” (TFP), because technological change is often “embodied” in new capital investments[4]. But in economies at an early point in the demographic transition, with fast labor force growth, it can be particularly difficult to raise investment rates by enough to increase the capital labor ratio.

Designing public policies to support this process calls for a good understanding of the market potential for jobs growth (conditional on the factor endowments and location) and of the constraints facing the firms that aim to exploit it. Of course, when policy makers seek to accelerate investment growth, they may be aiming at much more than better jobs. Nevertheless, better jobs are normally one of the central goals being pursued.

Policy makers have many instruments available to address the “demand side” of the jobs problem. There is often considerable scope for policy reforms that could improve competitiveness without the need for fiscal resources. They might include changing macroeconomic policies (such as exchange rate policy, the design and administration of taxation systems, trade and tariff policies) or the reform of regulations and the correction of market failures in product, financial and land markets (in additional to the labor market reforms mentioned above).

But where there are large JLEs, even where such reforms are feasible, they will still not lead to an optimal level of jobs-enhancing investments. It will also be necessary to directly address the JLEs by using fiscal resources. *The optimization of such expenditures is the subject of this paper*.

Internalizing JLEs requires subsidizing investments that exhibit significant gaps (attributable to expected jobs impacts) between the expected private rates of return and social rates of return. There are many established ways for governments to support or subsidize private investments, such as technical assistance, grants, interest rate subsidies, partial risk guarantees, tax breaks and subsidized infrastructure provision. Such support is often packaged through approaches such as: value chain development programs, entrepreneurship support programs, matching grant programs and business plan competitions. All these interventions, in the end, are a form of investment subsidy. They often aim to cover part of the risks or uncertainties faced by private investors in LIC

[4] TFP is the constant term A in a standard Cobb-Douglas Production function $Y=A\ K^{a}L^{(1-a)}$.

settings, which reduce the expected ex-ante returns of new projects below the weighted average cost (WAC) of the sources of capital that are available to finance them.

However, although job creation is usually an explicit goal of such policies and 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). In practice, projects are seldom selected for public support based on the jobs impacts the investments are likely to generate. The metrics that dominate the project selection process include financial returns, output and productivity. However, in the presence of JLEs, *maximizing firms' financial rates of return, output growth or productivity gains doesn't necessarily lead to socially efficient jobs outcomes*.

The paper models the outcomes of alternative criteria that might be used to select the firms and projects to benefit from demand-side interventions when the explicit focus is on improving jobs outcomes. To simplify the argument, we abstract from other possible motivations for the projects. We show that, if the purpose of providing public subsidy (whether in the form of grants or subsidized goods and services) is to offset JLEs, policymakers should start by estimating the amount of JLEs linked to specific projects.

In many public programs to support private investments the level of subsidies is fixed *ex-ante* at the same level for all selected firms/projects. However, in this paper we explore an alternative approach, using a bidding mechanism to incentivize investors to reveal the level of support needed for their investment to become privately viable. Projects could then be ranked based on the amount of JLEs they will generate per dollar of subsidy requested. The proposed selection mechanism equates private and social benefits, and given the available fiscal envelope, it maximizes the number of jobs created and has the largest impact on unemployment and underemployment rates of the alternative approaches modelled.

Another important aspect of the proposed "mechanism design" explored here is that the public subsidy would be a one-off catalyst, which aims to offset the perceived up-front risks and uncertainties that may tip firms' decisions against sinking resources into jobs-rich investments in LIC settings. Once they have been put in place, supported projects would be expected to become self-sustaining, based on their projected financial costs and revenues. Projects that would require ongoing fiscal subsidies to remain afloat would be avoided.

The proposed approach is consistent with a growing literature. It reflects two complementary ideas. *First*, as discussed above, there is a growing consensus that public policies (including subsidies) are needed to stimulate stronger private sector firm growth to increase labor demand, so that better jobs can be created, realizing the corresponding JLEs. *Second*, to allocate subsidies, policy makers should use an auction style "mechanism design" to persuade firms to reveal the private information needed to optimize the use of fiscal resources. (Warner, 2013, Barder and Talbot, 2015 and Carter and Plant, 2020).

The reminder of the paper is organized in four sections. Section 2 presents a brief review of the criteria that have been used to select the beneficiaries of demand-side interventions. Section 3 develops a simple model to show the difference between private and social rates of return in the presence of JLEs and derives a hypothesis regarding the optimal allocation rule for investment subsidies. Section 4 tests this hypothesis by introducing a more complex, and realistic, production function with two types of labor (skilled and unskilled) and conducts Monte Carlo simulations. We use the simulations to assess the potential impact of alternative subsidy 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. A Review of 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 a 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[5] 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 on 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 entrepreneurs’ incomes and/or improvements in business management practices. Outcome indicators such as number of jobs created, and workers’ earnings were less common.[6] 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

[5] 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.”

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

approximately USD 50,000, with a randomized treatment (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. [7]

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 and 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%.[8] A related but distinct literature studies the characteristics of successful entrepreneurs. This includes studies such as that by Nikolova et al. (2012) who use 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 expert panels can assess impacts on business outcomes and can impact jobs through this channel. 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 level of 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 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 of 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. An important caveat is that the

[7] 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 that awarded USD 9,000 to winners after multiple rounds of scoring and training. However, they were not able to measure impacts on jobs. 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.

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

large amount of variance explained by Fafchamps and Woodruff's data is driven by the fact that they used the *level* of employment (not growth or change) as their dependent variable and since the firms in their competition were mature (9 years old on average) they used data such as the current number of employees, which likely is what explains most of the variation in subsequent number of employees. Nevertheless, the point remains that a higher level of variation in employment can be explained as compared to revenue or profits which are two criteria also considered in assessing firm outcomes.

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, 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 JLEs. In terms of the second problem, finding a combination of indicators that can 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. As a minimum, it is important to separate vocational entrepreneurs from subsistence entrepreneurs. Once the variables /dimensions that predict the success of a business have been identified, it is 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 JLEs.

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.

2. Efficient Allocation of Investment Subsidies in the Presence of Jobs-Linked Externalities

In the simple two-period model presented in this section, we assume that any investment project[9] eligible for a subsidy produces goods and/or services (y) sold in the market at a price normalized to one, using labor (L), at a set wage of (w), and capital (I). Each project has a production function

[9] In this context, an investment project can either create a new firm with start-up capital, or expand production of an existing firm.

characterized by its average productivity of labor (v) and its capital intensity (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:[10]

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

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, expressed as capital per worker:

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

We observe that, given a level of investment (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 that have higher labor productivity and create few jobs or with other projects with lower labor productivity that create more 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.*

To calculate the social rate of return of the project, we consider two types of JLEs. First, we consider the so-called *labor externality*, or 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

[10] 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 $R = \frac{Gross\ Benefits}{Costs} - 1 = \frac{(Gross\ Benefits - Costs)}{Costs}$

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 JLE 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:

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

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[11]. We have:

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

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

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

Plotting the isocurves defined by equations (4) and (8) for given levels of rate of return, we see that isocurves that take into consideration JLEs 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 considering 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 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 JLEs (and yields the same return). This implies that some firms that have low productivity and very high job creation potential might not be considered by private investors even if they have substantial social rates of return.

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

When a subsidy is introduced part of the cost of the investment project is reduced 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 subsidizes 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 are no subsidies) $R_p = R_f$.

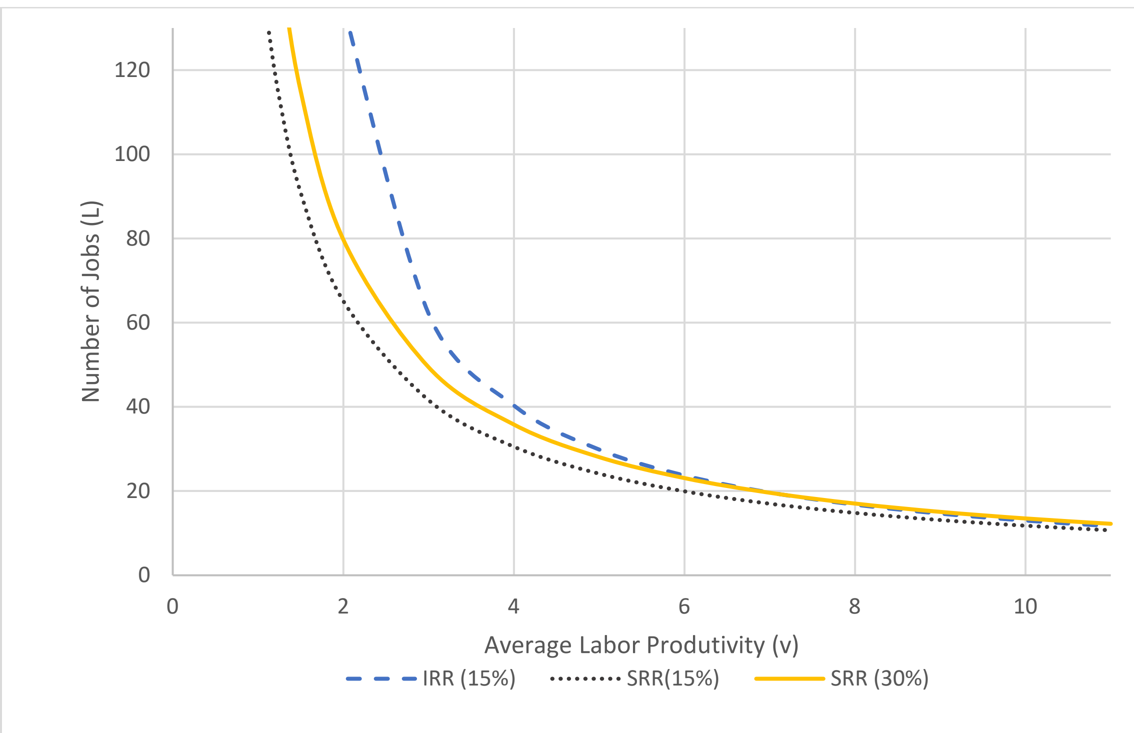
To calculate the optimal level of m we equate net private and social benefits (the numerators of equations 7 and 9).

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

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

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

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 not be chosen by private investors. Yet, we see that many of these projects have a social rate of return that is greater than 15%.

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 does not depend on the level of labor productivity, the capital per worker, or the level of capital.

We now turn to modelling the optimal allocation of a budget to subsidize private investment projects, when the policy goal is to generate sustainable improved jobs outcomes (i.e. earnings gains for workers and social externalities linked to the better jobs). It is simplest to think about this as a mechanism for allocating one-off, up front equity grants that seek to align the private and social returns of the chosen projects. However, the general principles that emerge from the analysis are relevant to optimizing the allocation of fiscal resources through any form of up-front subsidy to catalyze job-improving investments.

In principle, if we have a fixed budget and the goal is to capture as many jobs externalities as possible, projects should be ranked by the level of the total JLEs they generate. Thus, projects that create many 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) were 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.

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 JLEs 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 optimal subsidy will also vary across projects. Indeed, if the government sets the level of the subsidy, it should be proportional to the level of the jobs externalities. If, on the other hand, the required subsidy is defined by the investors as part of their business plans, they will likely have very different needs in terms of support. We can therefore define the level of the subsidy as:

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

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.

3. **Simulation of Jobs-related Outcomes under Different Allocation Mechanisms**

The purpose of this section is to model the impact of alternative criteria to select investment projects on business outcomes, such as the number of jobs created, the cost per job created, total output, and average labor productivity. We now 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:

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

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 parameters and variables of the production function, except for A, as uniform random variables (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:

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

This implies that TFP is given by:[12]

[12] This is done for computational simplicity. An alternative would have been to have a random A and solving labor or the level of investment or wages. The approach, however, doesn't change the insights from the simulations.

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

Using this model, we simulate a competitive bidding process where (virtual) participants submit investment projects expecting to benefit from a demand side intervention (i.e., implicit or explicit subsidies). As part of the bidding package they provide information about the amount of the investment; the level of support required from the government $(1-m)$; the number of low- and high- skilled jobs that will be created by the investment project; and the expected output.

Using this information, firms are ranked, based on seven alternative 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 dollar of subsidy (which 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	Share of investment costs financed by the investor.	[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 criterion, 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 competitive biddings each with a budget of USD 6 million. For each bidding, we draw 5,000 projects and drop those projects that: 1) have an FRR below 5% or greater than 35%; and/or 2) have a total investment cost (labor plus non-labor) above USD 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 the 500 draws.

The results confirm that it is important to take into account in the selection process the level of subsidy required by a project . Those selection criteria that do so (criteria 4, 5 and 6) are able to support a larger number of projects and therefore mobilize a larger amount of private capital. When projects are selected projects based on their FRR alone, an average of 166 projects are funded in each draw. In contrast, when the level of the subsidy is taken into account, the average number of projects funded surpasses 400 in each draw. As a result, the average amount of private capital mobilized increases from USD 22 million to over USD 57 million, and the average subsidy per project falls from USD 36,000 to 12,000-13,000 (see Table 3).

Table 3. Investment and subsidy amount 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.

The selection criteria that take into account the value of the subsidy per project also create many more jobs. Selecting projects based only on their FRR creates the lowest number of jobs: around 3,700 in total , with an average subsidy per job of USD 1,600. Selecting projects by their SRR; or based on the difference between the SRR and FRR (which gives more weight to jobs externalities) is better. Nevertheless, the number of jobs created per round of bidding is around 5,000 with an average cost of USD 1,000-1,200 per job. In contrast, 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: around 10,400 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 refer to 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 outcomes

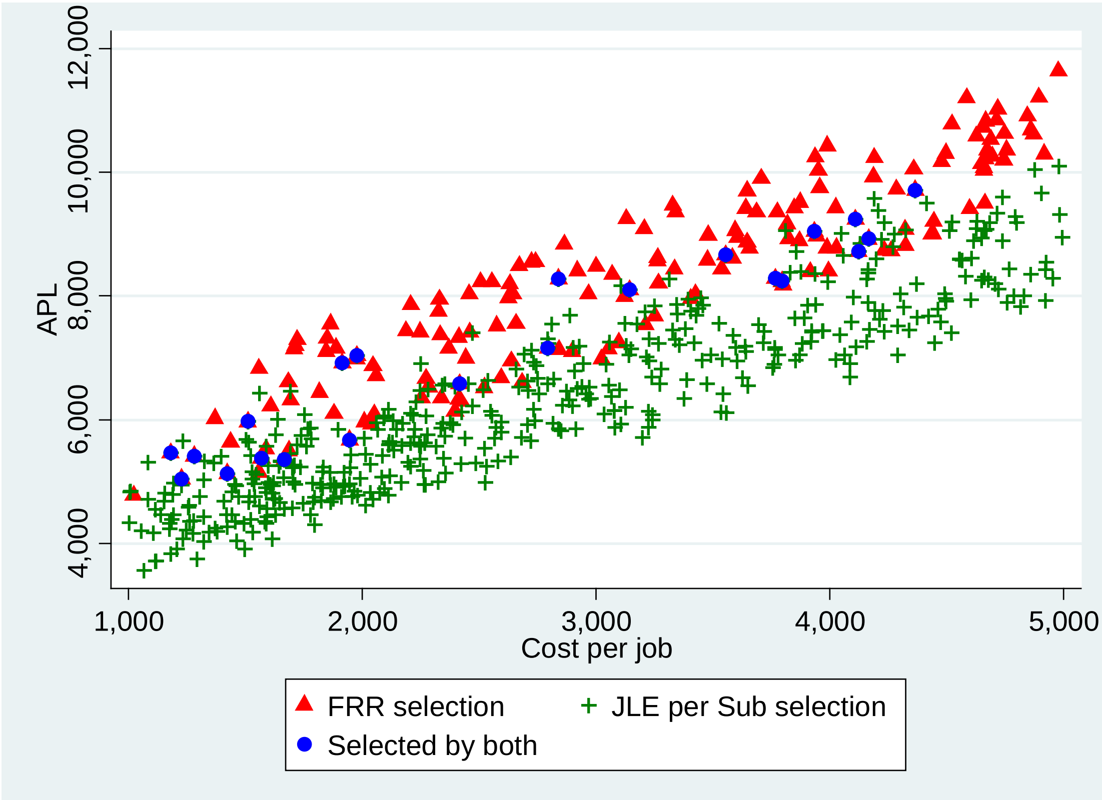
		Total jobs created	Jobs with social externalities	Aggregate value of JLEs	Average cost per job	Average subsidy per job	Productivity (output per job)	Aggregate SRR	Aggregate IRR
1. Net financial benefits per dollar invested (IRR)	mean	**3,743**	**1,971**	**1,765,750**	**5,826**	**1,606**	**7,813**	**45%**	**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 JLEs per dollar of subsidy, the FRR, or even the net financial benefits per dollar of subsidy. Creating more jobs, particularly low-skilled 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 based on 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 which graphs the outcomes of one of the simulations of a competitive bidding round. The green crosses represent projects that are selected when the criterion 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 (on the horizontal axis) green projects tend to have a lower average labor productivity than red projects. The green projects tend to be more labor intensive (they have lower capital 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

This paper develops and tests a simple mechanism to select the firms to benefit from demand side interventions such as value-chain development programs, SME support programs, or matching grants, when the policy objective is to create better jobs. Of course, if there are other objectives (apart from improving jobs) the conclusions would need to be modified.

The findings are clear. We show that the best approach is to use a competitive bidding process where entrepreneurs/investors are given an incentive to reveal the level of support required (the amount of implicit and explicit subsidies) and where the selection criterion is based on the amount of jobs-linked externalities that will be generated per dollar of subsidy requested. This indicator does not have to be exclusive, but it should be a required condition. It may be desirable to add other required selection criteria, for example, to reduce the risk of gaming in applications and to ensure the future financial viability the project, by verifying the managerial skills of the applicant and analyzing the sustainability of the financial cash flow.

Selecting the projects based on the level of the jobs linked externalities would promote investments capable of accelerating the transition of workers to more productive jobs than those they currently hold. These investments are likely to require relatively low levels of capital per job (more labor-intensive technologies) and have lower levels of labor productivity compared with other possible investments. 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 whose development impact (in terms of the number of better jobs that is created) is relatively small.

Clearly, challenges remain with the operationalization of the proposed selection criteria. The first challenge is achieving meaningful competition for the funds. Feasibility studies will be needed, to evaluate the demand from potential participants, so project teams can choose eligibility criteria that ensure enough participants for the auction mechanisms to function properly. The other challenge is the estimation of social externalities. As suggested in Robalino and Walker (2017), one approach is to define a "policy rate" for the social value of jobs for specific groups of workers. Setting those values would be part of the design of the demand-side intervention, in consultation with relevant stakeholders (Mousley, Ricaldi, Ridenour, and Khatib, forthcoming).

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