Commodity Booms, Human Capital, and Economic Growth. An Application to Colombia

RESEARCH PROPOSAL

Presented to

Partnership for Economic Policy (PEP)

By
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&
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Nataly Herrera
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COLOMBIA

June 30, 2017
There are three main areas/dimensions to all PEP-supported projects: research, capacity building and policy engagement/impact. The PEP proposal template is structured around these three dimensions. Each section must be completed with due care and attention, as they are reviewed individually and concurrently to assess the overall quality of a proposal.

SECTION I – RESEARCH

1.1. Abstract (100 to 250 words)

The abstract should state the main research question, the context and its relevance in terms of policy issues/needs in relation to PAGE thematic foci, complete with a brief description of the methodology(ies) and the data that will be used.

Empirical research has shown the procyclical behavior in the child labor and income shocks. We want to model the idea that a trade-off exists between the current level of consumption and the future levels of human capital. As shocks in the international prices of commodities affect current income and modify the optimal consumption basket, households adjust their preferences between schooling time and working time for the younger (school-aged) household members. Therefore, the dynamics of human capital accumulation can be affected and, with it, the prospects for economic growth and the sectoral composition of the economy, when commodity production and trade play a significant role in the economy.
1.2. Main research questions and contributions

Explain the focus (or key questions) of your research and its policy relevance.

Explain why you think this is an interesting research question and what the potential value added of your work might be (knowledge gaps). You might want to explain whether or not this question has been addressed before in this context (including key references), and if so, what do you wish to achieve (in addition) by examining the question again?

The motivation for this research is the empirical observation that child labor and income shocks behave in a pro-cyclical manner. That is, in trying to take advantage of expansive periods (with higher general income levels), households withdraw kids from the school system and send them to work at the expense of human capital formation. In this direction, Santos (2014) shows the implications of gold boom on child labor and school attendance in Colombia. According to this paper, the gold boom decreases school attainment in 0.2 standard deviations. The transmission mechanism is clear, the substitution effect dominates income effect, children leave the school to take advantage from the mining bonanza. The return to school system after prosperity is really scarce.

Beegle, Dehejia and Gatti (2006) examine the relationship between household income shock and child labor. The results show the pro-cyclical relation between income shocks and child labor. Particularly, the authors found that a transitory shock in crop prices in Tanzania increases the child labor in approximately 30%. The same mechanism was presented in Kruger (2007) for coffee production in Brazil. The empirical evidence shows how the education of poor and middle-income children may be adversely affected in the periods of economic growth. Cogneau and Jedwab (2012) explore this mechanism in the context of cocoa prices in Ivory Coast indicating that positive price shocks increased the incidence of child labor.

The child labor rate in Colombia was estimated at 9.3% for 2014, which means that about 1.05 million children in the ages between 5 and 17 are working.¹ There is also a wide disparity between child labor rates in Colombia between urban and rural areas, as its incidence in the former was 7.1% in 2014 and 15.1% in the latter. According to figures from the largest Colombian household survey,² only 70% of the children that are working attend school. Furthermore, according to the Colombian Ministry of Education, just 60% of the students entering the school system make it through graduation from high school and the within year drop-out rate is 3.6%, so about half the students getting into the school system exit before completion.

The impact of this issue extends beyond potential increases in child labor directly linked to the sector affected by the commodity boom (although in sectors such as coffee growing it may be important). at the beginning of the millennium, the number of children working in handmade mining in Colombia was estimated between 200000 and 400000, Heck and Ipenza (2014). For instance, there is statistical and anecdotal evidence that child labor may increase in sectors that provide inputs or services to the

¹ We will use the International Labor Organization definition about "child labour", which defines it as children between ages 5-17 years old. www.ilo.org
² DANE, Gran Encuesta Integrada de Hogares 2015.
booming sector, such as hotels, restaurants, commerce, and other personal services, as the experience of the oil boom has shown.\(^3\) Also, even in the case that there are no sizeable economy-wide effects of an increase in child labor due to the activity of a booming sector, regional and local effects may prove significant and only multisector modeling can provide clues as to their size.\(^4\)

There is a clear link between human capital and schooling as human capital is “the component of education that contributes to an individual’s labor productivity and earnings” (Son, 2010, p. 2). There is a sizeable set of empirical studies documenting a positive relationship between human capital and economic growth. For example, Azariadis and Drazen (1990) show that the literacy rate is significant in determining per capita GDP growth, while Mankiw, Romer, and Weil (1992) find relatively large elasticities of per capita GDP to enrollment rates. Barro and Lee (2010) also find an elastic response of per capita GDP to an additional year of schooling of the labor force.

Nonetheless, there is a body of literature that asserts that the causality runs in the opposite direction as economic growth increases the returns to education and this, in turn, increases people’s willingness to study and attain a higher educational level. This is the point in the works of Bils and Klenow (2000), which claim that the effect noted above has been erroneously enhanced due to omitted variable bias, and Krueger and Lindahl (2001), that claim that cross country studies do not control in an appropriate way for policies that are not stationary and lack valid instrumental variables.

From the schooling to growth perspective, increases in child labor rates and, in general, the increase in drop-out rates from the school system, lower the dynamics of human capital accumulation and this hinders economic growth. From the growth to schooling perspective, economic growth that does not increase the return to years of schooling would have a negative effect on human capital accumulation. These relationships lay the ground for an inquiry into the dynamics of human capital accumulation in a context in which returns to schooling are determined by the general equilibrium effects of sectoral growth and its associated demand for different types of labor (different schooling years), while human capital accumulation is affected by household decisions tied to current income and schooling decisions, as in the child labor case depicted above, that feed-back to economic growth.

We aim to analyse this issue by means of a recursive dynamic general equilibrium model that encompasses a schooling module that allows for keeping track of human capital formation and accumulation, as will be explained in the methodology section.

In light of the above, our main research questions can be summarized as follows:

- What is the effect of commodity price shocks on human capital accumulation at the economy-wide level?
- How do these effects feed-back into the composition of the labor force in terms of the

\(^3\) DPS, 2015
\(^4\) In order to determine significant effects from the commodities boom on the human capital formation we will try to do CGE model for a specific region in which the mining-energetic sector play a fundamental role in the households economies.
distribution of their years of schooling?

- How does the (changing) composition of the labor force interact with the demand for labor?
- What does this interaction imply at the sectoral level?
- What is the effect of the dynamics of human capital accumulation on GDP growth in the medium term?

1.3. **Methodology**

Presentation of the specific techniques that will be used to answer the research questions and how exactly they will be used to do so. Explain whether you will use a particular technique normally used in other contexts or whether you intend to extend a particular method and how you will do so. Explain if these methods have already been used in the context you are interested in (including key references).

For attaining the objectives listed above, we will use a recursive dynamic applied general equilibrium model. In particular, we will start with the single country, recursive dynamic version of the Partnership for Economic Policy (PEP) model, fully documented in Decaluwé et al (2012). This model extends to multiple periods the single-period PEP-1-1 model, by linking successive periods through a set of variables that are inherited from the previous one and transmitted to the following by a set of “dynamic equations”. The model belongs to the neoclassical tradition, in a perfect competition setting, and agents’ behavior is drawn from optimization problems. Since, as mentioned, the model has a thorough documentation, we do not expand here in describing it. Instead, we focus on the changes we plan to introduce in order to achieve our objectives.

There are two basic sets of changes that we need to introduce. The first refers to the utility function of the representative household, so its behavior takes into account schooling decisions affecting its members vis a vis the current stream of income. We posit that there is a trade-off between schooling and current income and that in the face of potentially increased current income, households may decide to stop the school cycle in return for higher income to the detriment of future human capital. The second has to do with the production side, in which we will assume that production depends on the levels on human capital that at the same time depend on the composition of labor force between adult labor and child labor. The quality and extent of human capital formation will be computed as the product of the interaction of educational outcomes, as affected by schooling decisions made by the households as follows from the first set of model adjustments.

The motivation for the type of household behavior we want to model stems from the idea that a trade-off exists between the current level of consumption and future levels of human capital. As shocks in the international prices of commodities affect current income and modify the optimal consumption basket, households adjust their preferences between schooling time and working time for the younger (school-aged) household members. Therefore, the dynamics of human capital accumulation can be affected and, with it, the prospects for economic growth and the sectoral composition of the economy, when commodity production and trade play a significant role in the
The above idea comes, theoretically speaking, from the following model. Assuming the representative household in the economy has one child, so that the utility of the household depends upon its consumption level \(c\) and the child’s schooling time \(h\),

\[ U(c, h) = \alpha u(h) + u(c) \]

Where \(u(h)\) and \(u(c)\) are nested neoclassical utility functions within an additively separable utility function and \(\alpha\) captures the importance of the child’s education for the household. The child has an endowment of one unit of time that is distributed between labor and study:

\[ l + h = 1 \]

where \(l\) is the time that the child dedicates to work. The household’s budget constraint is determined by labor income, which is defined by the labor income of parents and the labor income of the child if they are working. The labor income of parents \(l_i\) depends on the wage rate and their qualification (level of human capital), while the labor income of the child \(c_i\) depends on the price of commodities and the time spent working, adjusted by a factor that takes into account that she may not be as productive as a regular adult \((\varphi)\). On the other hand, the household spends its income on consumption and the cost of raising the child \((\theta wH)\), while the remaining income is saved \((S)\).

\[ wH + \varphi P_c l = c + \theta wH + S \]

The solution to this model generates the values of the endogenous variables \(c\) and \(h\), which provide the optimal decision of the household in terms of consumption level and schooling time. At the same time, this decision affects the evolution of human capital as its future level depends on the labor supply \((LS)\) and its growth rate \((n)\) and the Educative factor \((Educ)\).

\[ H_{t+1} = Educ_t(LS_t(1 + n)) \]

Where the labor supply grows at the population growth rate \((n)\) as following:

\[ LS_{t+1} = LS_t(1 + n) \]

The educative factor is a variable that takes into account the opportunity cost between the current and future wages \((w)\), the household income \((YD)\) and the government policies to avoid the educational dropping out \((GE)\). The last variable let us to add different policies from the government in order to simulate their specific implications on the different sectors of the economy.

\[ Educ_t = f\left(\frac{W_{t+1}}{W_0}, Y_D, GE_t\right) \]
As the optimal decision of the household is determined by the price of commodities, a trade-off ensues between current consumption and long term human capital levels, as commodity price shocks modify the current decision of the household and it has recursive implications on future levels of human capital.

We intend to model this intuition by means of a nested utility function that has, in the top nest, the decision between schooling and consumption of an aggregate commodity, and in the bottom nest the allocation of expenses between commodities. Both nests will be of the CES type. There will be only one representative household in the model, so the decision on schooling time must be read as affecting the fraction of school-aged people that this household wants to keep in the education system (i.e. it affects the total number of students that do not enter the labor force), so the number of children in the representative household does not play a role in the utility maximization problem, beyond the need to have it defined as the average ratio of school-aged people to the number of adults (people above the school-age range) in the economy.

An alternative approach is provided in Mitik and Decaluwe (2009), that model children’s time allocation between school and work (in their case household work) by means of a CET function. This way parents’ decision to allocate children’s time varies with relative gains, so that it maximizes children’s hypothetical future income, as given by changes in skill premium arising from education. In principle, we favor approaches of this type to the inclusion of several household types, as done in Fofana et al (2003) and Cloutier et al (2008), as it seems to better fit our theoretical approach.

On the production side, we suppose a production function depending on the stock of capital and the levels of human capital:

\[ Y = A F(K,H) \]

where the human capital levels depend on the labor force and its qualification

\[ H_{t+1} = Educ_t \left( LS_t (1 + n) \right) \]

At the same time, the labor force levels depend on the composition between adult labor and child labor in accordance to the following relation:

\[ L_{child} = \varphi L \quad \text{with} \quad 0 < \varphi < 1 \]

The child labor is less efficient than adult labor. This difference is represented by the parameter \( \varphi \), which expresses the equivalence between one unit of child labor and adult labor.

Therefore, the current and future levels of human capital are affected by the decisions of the households between current consumption and schooling. The human capital levels are made endogenous to the model for the different type of labor, given a population growth rate exogenous to it.

Finally, we will try to do a Macro-Micro simulation model in order to take advantage from the available data in Colombia. Following Cockburn, Emini and Tiberti (2014) is possible to use the
estimation in the CGE model to apply to a Micro simulation module. This approach let us to determine the specific effects of a shock of prices on the different sectors and categories of households and works. It means that by this way is possible to incorporate differences in the labor force and types of households in the model.

1.4. Data requirements and sources

This is a critical part of the proposal. The key issue is to explain the reason for the use of the particular data. You must establish that they are ideal for the question you wish to address and that you have or will have access to these data before your project begins. Please consult the “Guide for designing a research project proposals” for more detail.

We will build a SAM for 2014 for the Colombian economy, which is the latest year for which there are the relevant national accounts data available for this purpose (make and use tables and institutional accounts). There is also information on governmental expenses in education distinguishing between pre-school, primary, secondary, technological, and tertiary education, as well as recurrent expenses in the public educational system (generated within the institutional accounts of the Nation Accounts System).

On the other hand, we will require information on labor demand by educational achievement, which we can calculate from the Integrated Household Survey (Gran Encuesta Integrada de Hogares), also available for 2014.

From administrative records originated by the educational system and collected by the Ministry of Education we have data on the number of students by cycle (primary, secondary, tertiary) and data on failing rates, drop-out rates, and educational achievement by cycle. Additionally, we will need sector studies as a source for some base-year indicator of relevance for the model. Examples of these are Delgado (2014) which provides data on public investment in education, carrying capacity of the educational system, and duration of the students within the system; Iregui et al (2006) which provides a stochastic frontier analysis for estimating the impact of the socio-economic environment and school characteristics on educational achievement. Lastly, we need on population with age disaggregation, which is available from the national statistical office (DANE).

SECTION II – CAPACITY BUILDING

2.1. List of team members
For all team members, please indicate the age sex, as well as relevant/prior training and experience in the issues and research techniques involved (start with team/project leader).

Note that PEP favors gender-balanced teams, composed of one senior (or experienced) researcher supervising a group of junior researchers, including at least 50% female researchers, all contributing substantively to the research project. PEP also seeks gender balance in team leaders and thus positively encourages female-led research teams. (Each listed member must post an up-to-date CV in their profile on the PEP website – refer to “How to submit a proposal”)

<table>
<thead>
<tr>
<th>Name</th>
<th>Age</th>
<th>Sex (M,F)</th>
<th>Training and experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iader Giraldo</td>
<td>35</td>
<td>M</td>
<td>PhD from Universidad del Rosario with previous experience in research involving general equilibrium and economic growth models.</td>
</tr>
<tr>
<td>Ricardo Arguello</td>
<td>59</td>
<td>M</td>
<td>PhD from Cornell University with previous experience carrying out PEP projects involving the use of applied general equilibrium models and microsimulation techniques.</td>
</tr>
<tr>
<td>Nataly Herrera</td>
<td>31</td>
<td>F</td>
<td>Economist from Universidad Nacional de Colombia with experience in previous projects related to general equilibrium modeling.</td>
</tr>
<tr>
<td>Diana Londoño</td>
<td>25</td>
<td>F</td>
<td>Diana is student in the Master of Economics Program at Universidad del Rosario. She has research experience as a young researcher at the Universidad del Rosario’s Faculty of Economics and The health economics group at Universidad de Antioquia. Currently Diana is teaching assistant in a measurement economics course.</td>
</tr>
</tbody>
</table>

2.2. Expected capacity building

Describe the research capacities that team members (and potentially their affiliated institutions) are expected to build through their participation in this project.

This is an important aspect in the evaluation of proposals and should be presented with detail. What techniques, literature, theories, tools, etc. will the team and their institutions learn (acquire in practice) or deepen their knowledge of? How will these skills help team members in their career development? What are the current state of knowledge of each team members in regard to the project you are proposing?

<table>
<thead>
<tr>
<th>Name</th>
<th>Benchmark and expected capacity building</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iader Giraldo</td>
<td>The project will provide lader with a hands-on experience in building and using CGEs, an area in which he has developed limited previous work and we have a common interest in furthering. The activity will enhance</td>
</tr>
</tbody>
</table>


Iader’s expertise in this kind of models and lets delve into the dynamic modeling field to analyze other important issues in macroeconomics.

<table>
<thead>
<tr>
<th>Name</th>
<th>Role Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ricardo Arguello</td>
<td>Extend his CGE modeling capabilities to new applications: learn how to implement the educational module of the model, and adaptation of the theory inspiring the modeling of the household utility for use in a CGE model</td>
</tr>
<tr>
<td>Nataly Herrera</td>
<td>The project will supply to Nataly a new high level research about computable general equilibrium models. It will contribute to improve her economic tools and her experience in the developing of economic research.</td>
</tr>
<tr>
<td>Diana Londoño</td>
<td>The project will contribute Diana Londoño with an excellent opportunity to enhance her research at our Faculty; in particular for developing skills in data management and analysis, as well as in the use of national accounts data and in the construction of SAMs, besides getting exposed to the basics of general equilibrium modeling.</td>
</tr>
</tbody>
</table>

Add comments and describe institutional capacity building if applicable.

The Faculty of Economics at the Universidad del Rosario has made an ambitious effort to strengthen applied research and outreach. In this context it has developed a number of research projects in the development economics, public economics, and international economics areas, some of which have entailed the use of computable general equilibrium models. Three of these developments had the scientific, technical, and financial support of the PEP network and have contributed to the development of important analytical capabilities and technical skills in our Faculty. Continued work on these research areas is highly valuable for us both for academic and social purposes.

The project will contribute to cement our expertise in the development and use of computable general equilibrium models for policy analysis; in this particular case extending it to the use of recursive dynamic models.

The University is in the process of establishing an Observatory on International Economics, to which around eight undergraduate students are linked. It is our plan to involve them in this project in a limited fashion, through the development of a course on the structure of the Colombian economy, comprising a primer on input-output models and general equilibrium modeling. The work we will do for building the SAM will provide the basic material for the class and we will seek to cultivate these students interest in the topic we will be working on and in CGE modeling.

Indicate which specific tasks each team member would carry out in executing the project.

- Note that one of the team members must be clearly identified as responsible for coordinating and reporting on the design/implementation of the projects’ policy engagement and
communication strategy (see section III below). To achieve a more balanced task distribution, PEP advises to select a member other than the project leader.

<table>
<thead>
<tr>
<th>Name</th>
<th>Task and contribution to the project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iader Giraldo</td>
<td>Adapting the model to be used, general coordination of the project, providing guidance to the other team members, keeping track of coordination and discussion with people identified in the Policy influence plan. Analysis and discussion of results and preparation of reports.</td>
</tr>
<tr>
<td>Ricardo Arguello</td>
<td>Will perform as a local external resource person (additional to the resource person that PEP assigns to the project). Work on the adaptation of the PEP 1-t model and general assistance to other team members in SAM and database building, and in working with the CGE.</td>
</tr>
<tr>
<td>Nataly Herrera</td>
<td>Assisting in adapting the model to be used, responsible for building the SAM needed, and providing support for data collection and processing.</td>
</tr>
<tr>
<td>Diana Londoño</td>
<td>Responsible for data processing and analysis needed for building the SAM, assisting the building of the SAM, and calculating parameters needed for the model. Analysis and discussion of results and preparation of reports. She will be directly linked to the processing of household and manufacturing surveys in the context of building up the SAM</td>
</tr>
</tbody>
</table>

2.3. **List of past, current or pending projects in related areas involving team members**

<table>
<thead>
<tr>
<th>Name of funding institution</th>
<th>Title of project</th>
<th>Team members involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fedesarrollo (Colombia’s most prestigious economic research institute)</td>
<td>Determinants of Colombia’s manufacturing exports: A study based on a model of simultaneous equations.</td>
<td>Iader Giraldo</td>
</tr>
<tr>
<td>National Planning Department and ECLAC</td>
<td>Economic Costs of Extreme Events Associated with Climate. Methodology for Implementation of Risk Management Model to MEG4C</td>
<td>Iader Giraldo and Nataly Herrera</td>
</tr>
<tr>
<td>PEP</td>
<td>Dutch Disease, Informality, and Employment intensity in Colombia</td>
<td>Ricardo Arguello</td>
</tr>
<tr>
<td>PEP</td>
<td>Poverty Impacts of Agricultural Policy Adjustments in an Opening Economy: The Case of Colombia</td>
<td>Ricardo Arguello</td>
</tr>
<tr>
<td>Ministry of ICTs</td>
<td>Skills and occupational gaps in the Colombian labor market.</td>
<td>Diana Londoño</td>
</tr>
</tbody>
</table>
SECTION III – POLICY ENGAGEMENT

3.1. Policy context and needs

Describe the specific policy issues or needs that your research aims to address; how your potential outcomes and findings may be used in policy making? Please be as precise as possible, indicating specific current or prospective policies and the specific contributions your research would make.

Also, justify timing of your research in terms of policy and socioeconomic needs and context – e.g. reference to existing, planned or potential policies at the national, regional or local level; specific political context; international examples of similar policy problem or solution, etc.

Recent policy discussion on human capital in Colombia has been dominated by three issues: equity, poverty alleviation, and productivity/competitiveness. Policy directive issued by the central government (Conpes 3674, 2010) on the enhancement of the national system for human capital formation, calls for action plans for improved mobility between grades, cycles, and educational modalities, greater coherence between the school system and the productive sector, quality assurance within the educational system, and permanent learning for the whole population. On the side of the private sector, the National Competitiveness Council issued a Competitiveness Agenda for 2014-2018 that includes a chapter on human capital focusing on the enhancement of labor productivity while strengthening the coherence between the educational system and the labor market.

This discussion has developed based on the relative success of the Colombian government for improving gross enrollment rates that, for basic to medium education (two years less than high school) have grown from 90.6% in 2002 to 104.5% in 2009 (Conpes 3674, 2010). However, according to the government, there is still low gross enrollment rates for medium education, there is widespread heterogeneity in access to the educational system among income levels, and there are high failing and drop-out rates, leading to low high school completion rates. On the demand side, it is the income level of households and parent’s school level that determines entry and duration in the school system.

As a consequence, the government decided to issue human capital formation policy aimed at lowering the opportunity cost of education and operating within a framework based on three components, originated in the national competitiveness policy: (i) support for the private sector for enhancing productivity and increasing demand for labor, (ii) support for the science, technology, and innovation policy as a driver of productivity, and (iii) support for the provision of labor skills through the educational system.

On the other hand, the National Competitiveness Report 2015-2016 (CPC, 2015b) highlights that
there are low gross enrollment rates in preschool and medium education, while the Report on Recommendations for Filling In the Human Capital Gap (CPC, 2015a) asserts that around 57% of Colombian firms have difficulties with finding the right workers. Lack of general skills and sectoral specific skills account for 40% of this difficulty, lack of educational attainment and certifications account for 30%, and lack of experience for the remaining 25%.

We posit that an overlooked dimension of these problems, especially regarding low demand for educational services, has to do with the trade-off between current income and schooling, as explained above, with consequences for cycle to cycle promotion in the educational system and drop-out rates, that lower the gross enrollment rate and the overall educational attainment rate to the potential detriment of future growth. We expect to deliver results that inform interested parties in the public and private sectors on the role that this trade-off plays, so relevant public policy can be designed for overcoming its potentially adverse consequences.

Additionally, the recent peace process has generated a new discussion about the human capital formation, mainly in the rural areas. Now there are two different perspectives about the development of rural areas. From one side is the classical theory about land redistribution, and, on the other hand the new perspective that propose that given the institutional problems in our country, the easier way to solve the land problem is through the human capital formation, and that is, increasing the educational level in rural areas.

3.2. Consultations to date

List all (past) consultations with potential research users (e.g. policy makers or stakeholders) that have helped define your research question, and/or informed you of the specific policy context described above. Include a list of names, institutions and email addresses (add rows when needed).

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Institution</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fernando Jaramillo</td>
<td>Professor-Researcher</td>
<td>Universidad del Rosario</td>
<td><a href="mailto:Fernando.jaramillo@urosario.edu.co">Fernando.jaramillo@urosario.edu.co</a></td>
</tr>
<tr>
<td>Mauricio López</td>
<td>Professor-Researcher</td>
<td>Universidad de Antioquia</td>
<td><a href="mailto:Mauricio.lopez@udea.edu.co">Mauricio.lopez@udea.edu.co</a></td>
</tr>
<tr>
<td>Robinson Garcés</td>
<td>Regionalization directorate</td>
<td>Universidad de Antioquia</td>
<td><a href="mailto:Robinson.garces@udea.edu.co">Robinson.garces@udea.edu.co</a></td>
</tr>
</tbody>
</table>

3.3. Identify target audiences

Identify potential users of your research findings, including policy makers, advisors and other key stakeholders. Provide a list of institutions and, whenever possible, specific individuals to be targeted for effective policy influence. Please also indicate whether you have already made contacts within the institutions (add rows when needed).
### 3.4. Define outreach and engagement strategy

How, from proposal design to the dissemination of your research results, will you consult and communicate with these users to both gather their inputs and keep them informed of your project, in order to increase chances of research uptake? You can refer to PEP requirements in terms of policy engagement and research communication to have a better idea of what is expected in terms of grantees’ initiatives in this area.

A consultation process was carried out for defining the objectives and limiting the scope of this research proposal. We discussed the topic with several people at different levels, including both the public and private sectors. The most relevant were listed in the table above and in all cases they have shown interest in keeping track of the development of the research, as well as, in some cases, to help in providing data or supporting us in obtaining it.

### 3.5. Outline your preliminary dissemination strategy

Identify potential and relevant communication channels (e.g. direct stakeholder meetings, conferences, media/press, web platforms, etc.) through which you will be able, or attempt, to communicate and disseminate your research and research findings.
Outline your preliminary dissemination strategy. Note that PEP expects grantees to disseminate information about their research work and (expected) outcomes throughout the project cycle, and not only after publication.

Our purpose is disseminating the preliminary research results in several seminars in Colombian universities and institutions, as well as in meetings with governmental and private sector officials to be held at our university.

The academic seminars are the first step in our dissemination strategy. The seminars in Universidad del Rosario, Universidad de los Andes, Universidad Nacional de Colombia and Universidad de Antioquia will be the initial feedback on our research results. After academic seminars, we will start with the diffusion in the governmental institutions as National Planning Department, Central Bank and The Ministry of Education.

Additionally, we will use the University press office to spread the preliminary result from the research process in the academic and governmental field.

At the end of the project, we will publish the results in an academic journal.

SECTION IV – OTHER CONSIDERATIONS

4.1. Describe any ethical, social, gender or environmental issues or risks that should be noted in relation to your proposed research project.

There are no ethical, social, gender or environmental issues or risks related to this research that we are aware of.

4.2. References and plagiarism:

Applicants should be very careful to avoid any appearance of plagiarism. Any text of three or more consecutive words that is borrowed from another source should be carefully contained between quotation marks with a reference to the source (including page number) immediately following the quotation. It is essential that we be able to distinguish what you have written yourself from what you have borrowed from elsewhere.

Note also that copying large extracts (such as several paragraphs) from other texts is not a good practice, and is usually unacceptable. For a fuller description of plagiarism, please refer, for example, to the following website:
PEP will be using a software program to detect cases of plagiarism.

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