

The World Bank Knowledge for Change Umbrella Program Phase IV

Proposal Template

Summary Information

Basic Project Data

Project Title: Housing Working Women in Indian Cities: Transport Safety, Social Norms and Housing Costs

Project Duration: July 1, 2021 -April 30, 2023

DEC Task Team Leader (ADM): Forhad Shilpi

Co-Task Team Leader (if applicable): Alejandro Molnar

Managing Unit: DECSI

Contributing Unit(s): DECSI

Thematic Focus: Gender and Development

Regions and Countries: Country/Countries - please specify: India

External Partners (if applicable):

Total Requested Funding Amount

US\$ 120,000

Contribution to Development Objective

How does this project contribute to the development objective and program goals of the KCP, and the World Bank's institutional priorities?

In describing the female workers from the late-nineteenth century to the 1920s, Goldin (2006) noted that female workers in the labor market were generally young and unmarried, piece workers in manufacturing or domestics and laundresses in services sector. The female labor force participation (FLFP) was below 20 percent, with married women's participation rate lagging that of single women. This description is not that far from the typical female garment workers in Bangladesh in the 2000s or factory workers in China during the last couple of decades (Chang, 2009). In contrast, services activities predominate in many developing countries including India with more women employed in health and education services as semi-skilled and skilled workers. Whereas some large factories arrange for worker housing regardless of gender, modern services workers and workers employed in smaller factories need to obtain housing from the market. In urban areas where housing costs are high, one alternative is for unrelated individuals to share housing. This form of housing gained popularity in cities in both developed and developing countries (New York, LA, Shanghai, major Indian cities).¹ While young and unattached males have shared housing for decades, single women in India have only entered the market for "paying

¹ This type of housing has become very large and relevant in recent times in India. In recognition of its importance, the Parliament introduced a bill in 2016 to regulate the sector. See, [regulation of hostels and paying guest](#).

guest,” boarding houses or adult dorm housing more recently.² In many developing countries, including India, gender discrimination is legal and openly practiced in the rental housing market as gendered advertisements for rentals are common.³ Taking advantage of a unique dataset on room rental listings by gender from an online platform in India, this research project will address the questions of whether unattached female workers tend to pay more for housing than unattached men, and if so, what causes this gender difference. The importance of transportation safety and social norms in the choices made by women have gained attention in recent literature (Harten, 2021; Borker, 2020; Jayachandran, 2015) but, to the best of our knowledge, no paper has yet addressed the interaction of these factors on the rental premium paid by women.⁴

Our preliminary analysis of data from the largest 7 cities in India confirms that comparable rental arrangements listed as female-exclusive are 7.8% more expensive than male-exclusive rentals. The only prior study of gender-gaps in the rental arrangements of unmarried workers (Harten, 2021) finds that women pay a 10% premium over men in Shanghai. However, women face additional constraints in the context of traditional and conservative patriarchal societies. Our study will quantify two sources of the gender premium in rent: equilibrium response of market rents to the cost of commuting (generalized to include safety from harassment and physical harm for women), and social and gender norms that tend to discriminate against women, particularly single women.

With improvement in women’s education attainment and an increase in their age of marriage, many developing countries are facing waves of new entrants of unmarried and unattached women in the labor force. These demographic and educational changes in China have led the share of unmarried urban women among those in their late 20s to increase fivefold in just 20 years, from 4% in 1990 to more than 20% in 2010 (He, 2014). Despite similar demographic changes in India, female labor force participation (FLFP) in India remains stubbornly low (Jayachandran, 2015). According to NSS data for 1993/94 and 2011/2012, FLFP of unmarried women (18-30 years of age) remained unchanged at about 24% between these two years while that of married women belonging to same age group remained flat at 12% over the same period. Access to affordable housing may play a role in low FLFP among unmarried women in urban areas.⁵ By focusing on the sources of higher housing costs for women, this project will provide evidence on the appropriate policy responses needed to reduce gender welfare gaps, and hence encourage more women to join the labor force. The policy recommendations of this paper will be directly relevant to enhancing women’s economic opportunities, a core goal of the World Bank’s gender strategy (World Bank, 2015).

² Right after India's independence in 1947, the "women's development" discourse flagged housing for working women as a policy priority ([Towards Equality](#), 1974). The YWCA has a history of building "working women's hostels" or dorms but working women's housing dropped off the agenda during last decades.

³ In the US, the Federal Fair Housing Act bans gender discrimination in almost all housing arrangements. A rental listing may only express a gender preference if the dwelling is occupied by the owner.

⁴ We provide a detailed review of literature in Section 2.

⁵ Nearly half of urban young (18-30 years of age) female labor force belong to unattached/unmarried category and a large majority of them form the potential market for this type of housing.

Proposal Details

Project Design

1. Please describe the overall design of the project, which may include objectives, research questions to be answered, conceptual framework, analytical approach and methodology, and data requirements.

To motivate our research questions, we start with some evidence on harassment faced by women in transport, and social attitudes toward renting to women particularly in the context of India.

Harassment of women in transport is common in developing countries cities.⁶ In a survey of 9995 women in 11 cities in India, 95 percent of the women reported public transport to be unsafe (Shah and Raman, 2019). This concern for safety is reflected in women's choice of mode of transportation as well as location of residence relative to work. While women walk or take a bus to work, men are more likely to use bikes and motor bikes to commute (Census of India, 2011). More than 55 percent of women in India commute less than one kilometer, compared to 40 percent among men (Census, 2011). One of our focus is whether unavailability of safe commuting route and preferred mode of transportation could drive women to living closer to work and paying higher rent.

Gender preference and segregation in housing is legal and widely practiced in developing countries.⁷ In this market, an unattached female renter confronts social barriers: in a paternalistic society, a woman's identity is often defined by her marital status, and women are held to a stricter definition of respectability. The social attitude toward renting to unmarried women was succinctly expressed by Suruchi Sharma, an educated female manager in digital marketing living in Mumbai, in an interview to the BBC: "...There have been many occasions when I have tried to rent an apartment in a good locality and been refused. People don't like to rent apartments to single, professional women. They are afraid that someone like me will behave immorally - have loud parties, have men to stay overnight, be a bad influence on the surrounding families...."⁸ These social norms may lead women to rent higher quality housing than desired out of concern for respectability, or simply to pay higher rent than men for equivalent accommodations due to the unwillingness of landlords to rent out to women.

Research Questions

In this broader context, this project will address three questions regarding the gender gap in housing rental markets in the 7 largest cities in India:

- a. Do single/unattached women pay more rent than comparable men?

⁶ Some form of harassment in transport is also present in developed countries.

⁷ This is as opposed to labor market where discrimination is often invisible and very difficult to detect (see for a review, Das (2015)). Das et al. (2019) found that employer's attitude towards women did not matter as much for hiring of women in India after accounting for location and firm characteristics.

⁸ [No country for single women](#). BBC magazine, 4 March 2014. See also [Single women are often denied the basic right to a roof over their heads: Shikha Makan](#). The Economic Times, March 3, 2018.

- b. Do women sort into more expensive housing? Women may respond to harassment and an unsafe environment by demanding rentals in walking distance of employment centers and relatively safer public transport modes (e.g. metro) – resulting in a double tax on women from harassment. In other words, the amount of harassment that is observed does not tell the whole story, because women pay more rent to avoid harassment.
- c. Do social attitudes toward single women in a traditional society with strong gender norms lead women to pay more than men for equivalent locations and accommodations, beyond the location sorting induced by commuting safety?

As a preliminary analysis, we map below some rental listing data from an online advertisement platform (OLX) and crowd-sourced travel safety data from NGO Safetipin which suggests a positive correlation between transport safety and rent paid by women. Figure 1 plots average differences in asking rent by gender for gender-specific rental listings, the locations of which are observed at the level of “real estate neighborhood” in greater Mumbai metro area. Plotted in shades of pink are the neighborhoods in which women appear to pay a “pink tax.” This pink tax is also observed in the vast majority of locations in Delhi and Kolkata, and a majority in Ahmedabad, Bangalore, Chennai, and Hyderabad (not mapped). For comparison, in Figure 2 we plot the travel safety index as rated from multiple factors by Safetipin (multiple reports). Comparison of these maps suggests a positive correlation between indicators of safety and higher rent paid by women.

Fig 1. shows that sorting is not the whole story: it appears that single women pay more conditional on location at most locations throughout the city, even if this is particularly true at safer locations. This pattern suggests a lower elasticity of supply for shared rental and “paying guest” housing for women, possibly driven by gender norms.

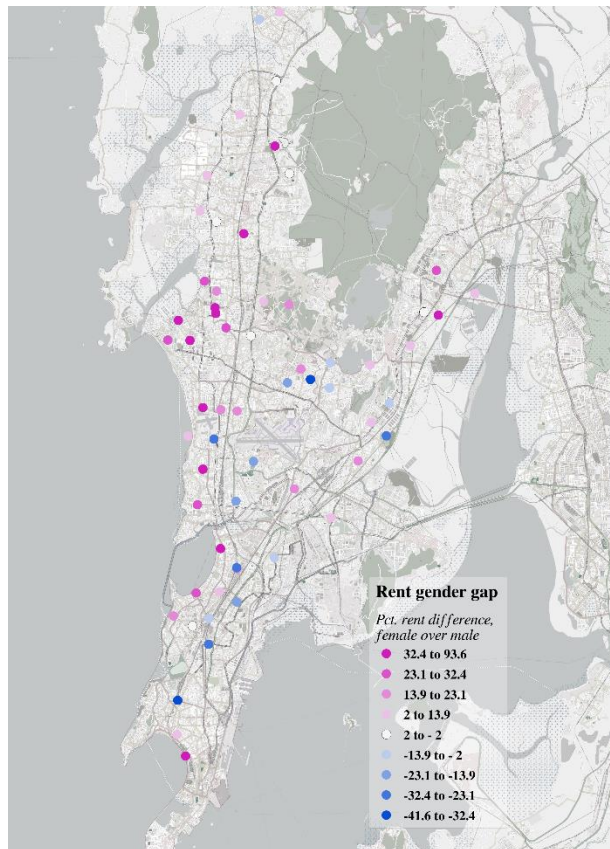


Figure 1. Mumbai, 2018-2019.
Gender gap in neighborhood-level average rent

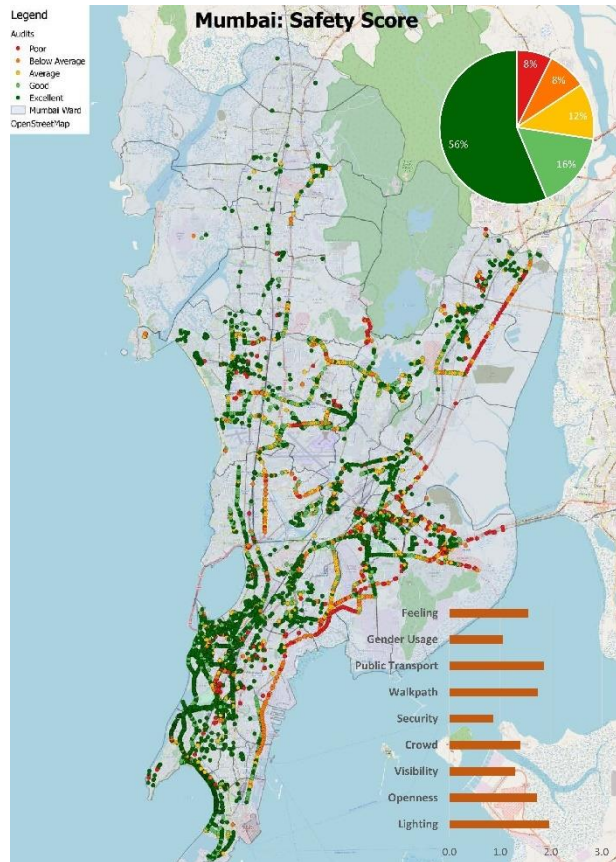


Figure 2. Mumbai, 2019
“Safety score” audit values by Safetipin

Conceptual Framework:

We sketch the outline of a model underpinning the empirical analysis and describe the main intuition behind our empirical approach. To estimate the effects of commuting cost and safety on sorting of men and women in residential neighborhoods, we will extend the standard urban spatial model in several directions. In standard urban spatial models (Redding and Rossi-Hansberg, 2017; Ahlfeldt et al, 2015), demand for residential neighborhoods is determined by preferences for amenities, transportation costs, the locations of employment centers and the equilibrium price of housing. A standard quantitative spatial economics model solves for equilibrium residential locations and rents, as well as latent commuting flows, as a function of urban amenities and employment.⁹

⁹ Employment may take the form of a given employment structure or a fully-modeled urban production sector.

Recognizing the differences in the types of jobs that men and women do in India (e.g., men in manufacturing, finance vs. women in education and health care), we assume that jobs are gendered to a degree that varies over space. Perceived risks to safety on different transport modes (walking vs. bus vs. metro etc.) are also different across gender. The elasticity of housing supply may also differ by gender, possibly reflecting unfavorable social attitudes towards women renters. This last assumption is introduced to account for the heterogeneity of rents paid by men and women within the same neighborhood for the same living space, resulting in rental gaps in equilibrium and neighborhood sorting of women and men. We utilize a quantitative spatial equilibrium model under the assumption of fixed locations of gendered employment.¹⁰ Empirical specifications will be derived from this model.

Econometric Approach:

For each city and neighborhood, our dataset records asking rental rates and provides information on characteristics of the apartment (including number of beds, availability of a kitchen, number of bathrooms, etc.), the living arrangement (solo, shared, paying guest) and, most important, the gender to which the unit is offered. The first step in empirical estimation will be to run a hedonic regression to residualize rent of observable housing attributes. We will then regress residualized rent on a female dummy and neighborhood fixed effects. The magnitude and statistical significance of the coefficient on the female dummy quantifies an average “pink tax” on female rentals throughout each city. The magnitude of this tax is determined from an interaction between two forces. Differences in the elasticity of housing supply by gender impose a “tradition tax” on women – if this were the only force at play, all of the “pink tax” (and any variation in it over space), could be attributed to variation in the traditional norms that underpin willingness to rent to different genders. However, given some degree of inelastic supply in housing for both genders, actual rental values will be determined by the interaction of supply and demand by gender. If the residential demand from women is more localized than that of men (for example, if they demand safer and more central locations with shorter commutes) then local rent for women will be bid up in a manner that amplifies the effect of tradition. Equilibrium rents by gender, and the sorting of women into more expensive locations, therefore, also reflects a “safety tax” on women.

To isolate the effects of commuting cost and safety on sorting of men and women in residential neighborhoods, we take neighborhood-level averages of adjusted rental prices (residuals from hedonic regression) by gender. The dependent variable is then defined as the gender gap in rental rate by neighborhood. To see whether a woman pays a premium to live in a neighborhood from which commute to work will be safer, we use two sources of variations for identification: distribution of gendered jobs across the city, and modes of transport for which perceived risks of harassment vary. For instance, women in Indian cities view buses as less safe than metro. Using the location of jobs, and mode-specific transport routes to reach them,

¹⁰ This assumption can be relaxed with access to data on the distribution of single men and women, which we are pursuing.

we will compute a residential location's commuter market access (CMA) for each transport mode, under assumptions from the literature on the rate at which access to employment decays over distance.¹¹ The gender gap in rental rates will then be regressed on these measures of CMA. Their relative coefficients will provide measures of premia for safety. With access to Safetipin data on commuter safety along transport routes, the measures of CMA can be further refined by separating out safer modes (e.g. walking along lighted roads) from unsafe modes (e.g. walking along dark roads).

An additional estimation challenge is that the rental premium may depend on location amenities. Location amenities that are equally valued by both genders will be absorbed by fixed effects, but any difference across genders in the valuation of location amenities could affect the gender gap. We will develop data on urban amenities (parks, shops, restaurants, etc.) to control for observed amenities. Finally, our dataset also includes listings which did not specify gender which could potentially raise selection concerns. We'll use this part of data to check whether these listings are different from our sample listings in any systematic way and would address it accordingly.

Data

The regression analysis will require merging of data from different sources including economic and population censuses and NSS data on the labor force. Our rental data comes from online platform OLX and consists of real estate property listings for 7 main cities (Delhi, Mumbai, Bengaluru, Chennai, Hyderabad, Kolkata, Ahmedabad) over 2018-2019. Out of 2.4 million property listings we select the 129 thousand listings for "paying guest and guest house" accommodations, of which 52.5% contain explicit gender restrictions (highest at 63.3% and 61.9% in Kolkata and Ahmedabad, and lowest at 47.5% and 48.9% in Hyderabad and Delhi). The location of a listing is provided at the level of a "real estate neighborhood" – a drop-down option on the OLX platform. We observe 4,955 neighborhoods across 7 cities in our data. Listings contain 15 coded attributes (e.g., area, carpeting, parking, furnished) and we additionally text-parse the listings descriptions for an additional 29 indicators of amenities (e.g., air conditioning, WiFi, TV, washing machine, parking, meals provided).

Although property listings regularly contain text advertising proximity to transit, we will augment our listing data with measures of mode-specific commuter access to employment by gender. Time costs to employment locations will be computed from transit infrastructure and a mode-specific routing model, as well as the distribution of employment by gender throughout each city. We have also obtained access to granular population movement data from the suite of Facebook-owned mobile phone applications, which we are evaluating for use in this project.

Safety Data: Road safety and travel mode safety data are collected through crowd sourcing by two popular mobile Apps (Safetipin for route safety, and Safecity for mode safety). We are

¹¹ Alternatively, the decay rate can be jointly estimated using Non-Linear Least Squares.

exploring access to these data. Though estimation can be carried out without access to these data, having them will be helpful in pinning down effects of safety among different modes of transport, particularly walking.

2. Please provide a brief literature review and explain the study's intellectual merit.

This paper relates to two broad strands of existing research examining how women's outcomes are influenced by urban mobility and social norms and cultural attitudes. How women's choice of places of work and residence is influenced by commuting time has been the subject of a literature in developed countries. Women tend to choose jobs that are closer to their residence and this preference for shorter commute is found explain between 14 to 21 percent of residualized gender gaps in wages in the US (Le Barbanchon et al, 2021; Liu and Su, 2020). Liu and Su (2020) find no difference in commuting choice of single women and men, suggesting that the shorter commute choice is driven by married women with family obligations. Using mortgage data from Beijing, Gu et al. (2020) finds that compared with the husbands' commute, new homes are on average 11% closer to the wife's workplace by distance and requires 4% less commute time. The home location choices and the resulting gender commute differences in this case emanates from the intra-household division of labor and differences in bargaining power.

Compared with developed countries, women in developing countries face the additional constraint of harassment during their commute. Borker (2020) provides evidence on the impact of harassment along travel route on women's choice of college in Delhi, India. She finds that women are willing to choose a college in the bottom half of the quality distribution over a college in the top quintile in order to travel by a route that is perceived to be one standard deviation safer. Such choice affects women's human capital attainment adversely. The policy of providing women only public transport – viewed more as a palliative short term policy in response to harassment faced by women – is found to reduce harassment but has the unintended consequence of increasing stigma and other forms of aggression (Aguilar, Gutierrez and Soto Villagran 2019, Kondylis et al. 2020). To the best of our knowledge, how safety along commuting routes affect women's housing choice has not been studied in the context of developing countries.

Social norms and attitudes are important in determining gender gaps in health, education and labor force participation (Jayachandran, 2015). The evidence on the implications of social norm for gender gaps in housing market is still slim. Goldsmith-Pinkham and Shue (2020) estimates that single men earn 1.5 percentage points higher unlevered returns per year on housing relative to single women in US. One important source of this gender gap is social attitude towards negotiation style: both men and women expect women to be more willing to share the surplus from negotiations and are more willing to walk away from aggressive offers if those offers are proposed by women. In the context of room rental in shared housing, Harten (2021) finds that women pay a gender price premium of almost 10% to rent in better, less crowded conditions. The premium is driven by concerns for personal safety and social pressure

to maintain respectability. This research project aims to contribute to this literature by studying this market in multiple cities in India, with varying degrees of patrilocal and patrilineal customs. To the best of our knowledge, no study has examined the combined effects of social norms and transport insecurity on rents paid by women. This interaction is likely to be important for policies to encourage young women to join in the labor force as transport alone or housing alone may not be able to solve this issue efficiently.

Relevance and Policy Impact

3. Please demonstrate the policy relevance, value added, and potential development impact of the proposed project for Bank operations and/or in developing (or transition) countries.

Gender equality is a key focus of World Bank's twin goals of ending extreme poverty and boosting shared prosperity in a sustainable manner (World Bank, 2015). Three key focuses for ensuring gender equality in World Bank's gender strategy are improving women's endowment, economic opportunity, and agency/empowerment. Two indicators are widely used in discussing women's economic opportunities (World Development Report, 2012) and computing gender equality index by the World Economic Forum: women's labor force participation and earnings relative to those of men. This is line with the traditional focus of the economic literature on gender gaps and is necessitated by a lack of gender-differentiated data on the cost of living. With digital development, these data are becoming available. With availability of housing cost data, this research project brings into attention the need for a broader measure of the gender gap. The widely used earning gaps are likely to underestimate the gaps in living standards since women need to pay more for housing.

Since we will study the interaction effects of social norms and transport insecurity on rents paid by women, our research will generate evidence on the policies for closing the gender gaps in the areas of transport safety and housing supply. This will be useful not just for India but also for urban areas in other developing countries. Urban housing and transport investments are often carried out in a gender-neutral way. For instance, walkable roads are treated as a quality-of-life local amenity in developed countries. In India, making an area "walkable" and safe (e.g. paths, bridges, separating traffic from pedestrians, lighting) could also increase women's labor force participation through access to employment. Similarly, relaxing housing regulations to increase housing supply elasticities in areas closer to female work clusters can also increase female labor force participation and reduce gender gaps in living standard. Finally, social and cultural norms may be slow to change, but they are not immune to change in response to financial incentives (e.g. to delay marriage in Bangladesh (Buchmann et al., 2016) or information campaigns (TVs role reducing family size in India; Jensen and Oster, 2009). The research project is timely for India where the labor force participation of urban women has remained low and increasing this participation has been a major policy goal.

Implementation Plan

4. Please describe implementation arrangements, including timeline, key team members and their roles.

The overall work program will last for 20 months. During the first year, the all datasets will be cleaned and put together and econometric and modelling analysis will be conducted. During the next 10 months, econometric analysis will be finalized and papers will be written.

Year 1 (July, 2021-June, 2022)

- During the first year, we propose to complete compilation of datasets. This include parsing and converting text from advertisements in OLX platform into useable data using machine learning technology, developing the routing tool to identify commuting routes and estimate travel times, merging in Safetipin and Safecity data to compute travel safety indices for neighborhood as well as along commuting routes, and cleaning and merging population and economic censuses and NSS surveys (labor force, consumption modules).
- Team will also complete work on the theoretical model and most of the econometric analysis.

Year 2 (July, 2022- April, 2023)

- Finalizing econometric analysis and writing of papers (1 academic and 1 policy papers)
- Submission of papers to working paper series and peer-reviewed academic journals
- Dissemination of findings to diverse audiences through a variety of channels, including policy workshops, academic conferences and seminars, and blogs.

The composition of research team and responsibility of each team member is described in the table below.

Name	Organizational unit/affiliation	Responsibilities
Forhad Shilpi (<i>Senior Economist</i>)	DECSI	TTL: Responsible for conceptual framework, econometric analysis, and writing of the paper. Also, for administrative responsibility.
Alejandro Molnar (<i>Economist</i>)	DECSI	CO-TTL: Responsible for conceptual framework, econometric analysis, and writing of the paper. Will develop the routing tool, supervise conversion of texts from advertisement into useable data, software development needed for econometric analysis.
Geetika Nagpal (<i>Graduate Student</i>)	Brown University	Responsible for data cleaning, merging, econometric analysis, literature review and writing of the paper. Collaborate on design of conceptual framework.
Francisco Tuñón	Universidad de San Andres	Responsible for data cleaning, merging, econometric analysis.

- Please outline expected outputs (working paper, publication, computational/analytical tools, datasets, etc.) and specify the expected date of delivery for each output.

It is expected that the project will yield the following outputs:

- Two published articles. One article will be submitted to top ranked peer-reviewed journal and other will be a policy focused paper submitted to refereed journals with a wider policy audience. All research papers would appear initially as World Bank Policy Research Working Papers.
- Blogs on Let's Talk Development, Ideas for India and other blog series that describe the key findings of the research.
- Interactive map dashboard: our team can develop interactive web maps, and we will develop these for expository and dissemination purposes – for example on the local cost-of-living improvements that can be attained from improvements in transport and access to employment.

- Datasets used in the analysis will be made available through [OpenICPSR](#) depository.
6. Please document evidence on the consultation process with relevant research and operational units within the Bank or with external stakeholders.

The proposal was discussed with Kathleen Beegle of gender group and circulated to Arturo Ardila-Gomez (Global Lead Urban Mobility and Lead Transport Economist), Maitreyi Das (PM, SURGP) and Judy Baker (SURDR) of urban GP for their comments. The proposal has been revised on the basis of comments from Maitreyi Das and Arturo Ardila-Gomez.

Capacity Building and Partnerships

7. Please describe planned activities on strengthening institutional and/or human capacity in research, data and analytics in developing countries, if applicable.

The study team includes two members from developing countries. Geetika Nagpal is an Indian national and currently a graduate student at Brown University. Francisco Tuñón is a master's student at the Universidad de San Andres, in Argentina. Both will be very much involved in all aspects of the research project. This project will provide Francisco pre-doctoral research training and experience.

8. Please describe expected collaboration between DEC and colleagues in operations of the Bank (Regions and/or Global Practices), and/or with external stakeholders, if applicable.

Not Applicable

Communications, Dissemination, and Replicability

9. Please describe planned activities on communication, dissemination, and repackaging of project outputs to reach target audience and policy makers.

We plan to utilize several different avenues for dissemination. The publication of papers in prominent journals as well as release of the papers through the Bank's policy research working paper series will be important ways of disseminating our findings to a broader audience of academics and policy makers. We will also present the findings of our research at conferences, workshops and seminars arranged nationally and internationally. The research findings will also be useful for our colleagues in South Asia region who are engaged in policy dialogues regarding improving women's economic opportunities and engendering transport investment in India.

10. Please describe plans on documentation, archiving, and sharing of relevant data and codes to be produced in this project.

The project will follow American Economic Association guidelines for documentation and replication packages. All data sources will be documented in detail, with a readme file describing how data were cleaned and merged. The codes for data cleaning and econometric analysis will be posted in [OpenICPSR](#) depository.

Disbursement and Financing

Please describe the desired disbursement schedule and requested funding amount per disbursement.

Is there co-financing involved in this project? No

The project will finance three types of activities.

1. Funding for research assistants (2) over a period of 22 months (\$60,000)
2. Travel to India (2 trips): (\$20,000)
3. Data purchase and ground-truthing exercise (\$40,000)

Budget Details¹²

Activity	Expenditures under KCP		Total expenditures over the lifetime of the project, of which		
	FY22	FY23	KCP	Bank BB	Other sources
Research Assistants	40,000	20,000	60,000		
Travel to India (2 trips)	10,000	10,000	20,000		
Data Purchase	40,000		40,000		
Total	90,000	30,00	120,000		

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¹² Note: Under the Bank's new Cost Recovery Framework for Trust Funds effective January 1, 2021, the 12% cost recovery fee (previously known as the indirect cost of 17% charged on personnel costs) for BETF will not be charged at the grant level but at the trustee level. Teams will not need to include such costs in the proposed project's budget.

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