

Gender, Travel and Job access: evidence from Buenos Aires

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Abstract

Much still needs to be done to make transportation planning and mobility studies adequately gender-informed. The intersection of gender, transport and mobility has rarely been quantified, and the limited work that has been done is mostly limited to the Global North. In this paper we use the 2009 Household Mobility Survey for the Buenos Aires Metropolitan Region to explore the differences in travel patterns for men and women. We complement data on the travel time and daily ridership of men and women, with spatial data to highlight the differences in travel patterns, as well as the complexity of women's daily travel. Our research confirms findings in the literature that suggest that women are responsible for a disproportionate share of the household's transport burden while at the same time having more limited choices for mobility. However, the spatial data allows us to identify an important outcome of this combination on commute choices (i.e. job-location outcomes) for particular segments of working women. In general, trips made by women, particularly women with children were made at significantly lower travel speeds, indicating in particular that these segments of working women had smaller commute-sheds than similar men. At the same time, there was little difference in *travel times* between men and women – echoing findings in the constant travel-time literature. Indeed, if average travel speeds for women go up to equal those of men and average travel times remains the same this opens up more opportunities in the labor market; 20%-80% more jobs on average. Though the available data do not include data on wages or causality – this finding suggests that a combination of inadequate mobility choices (including unequal access to private mobility) combined with more complex travel needs – may well be forcing some women in BA to not be able to access the same range of work opportunities as men. Though more detailed and particular surveys will be needed to quantify any impacts of mobility constrained labor outcomes on wages – the systematic difference in commute sheds is important in itself. We conclude with (i) ideas transport planners can use to ensure that mobility systems are designed and operated in ways that respond to the particular travel needs of women; and (ii) suggestions on how to make transport planning more gender-informed.

The focus of this work is to examine gender differences in travel patterns of trip-makers in greater Buenos Aires, assessed using travel survey data. By extending tools commonly used to analyze urban mobility patterns into a spatial frame – we find important differences between spatial commute-sheds, resident's employment location, of segments of men and women working in the labor force; differences that are accentuated in certain income strata and demographic segments. The results suggest that the commute-sheds of women with dependents without access to cars are smaller than those of the equivalent men. While the travel survey data we are using does not allow inferring causality – the sharpness and consistency of the results suggest that mobility-related accessibility constraints could be limiting women's ability to achieve their potential in the labor force.

Context

An increasing focus on gender issues in urban mobility research has yielded important insights on the manner in which embedded differences in social relations and urban practices translate into the nature of demand and use of mobility by men and women. As Peters (2002) notes "*The core finding of all existing evidence is that women are responsible for a disproportionate share of the household's transport burden while at the same time having more limited access to available means of transport.*" There is now widespread recognition in the literature of this "unfair distribution of accessibility" between men and women (Levy, 2009; Vasconcellos, 2001; Lefebvre, 1996). There is also an increasing recognition that the next step is the need to assess the manner in which these endowments translate to differences in social and economic outcomes. Limited work explores this dimension.

Initial research by Levy (2013) found spatial and temporal differences in the travel patterns of men and women in Hanoi and Peru which hindered the mobility options of women. Another example is a travel survey in a 1000 household slum in Delhi, Anand and Tiwari (2006), which concluded that *“to minimize travel time and balance the overlapping schedules of work and household responsibilities, women also seek to minimize their travel time and to choose work opportunities at shorter distances from home.”* The question of interest for this work was to see how these findings translate outside the particular limited context of study.

Gender Analysis ENMODO

The data used for this study was provided by the Household Mobility Survey (Encuesta de Movilidad Domiciliaria, ENMODO) for the Buenos Aires Metropolitan Region. The survey, performed in 2009, included a representative sample size of 22,170 households and 70,321 people. As part of the survey a publication was released that presented the mobility patterns of the city (ENMODO, 2009-2010).

The primary study included a very basic gender component. The gender analysis included:

- Socio-Economic Analysis: Population composition by gender, age, medical coverage, education and region
- Travel Analysis: Percentage distribution of trips by gender and household income quintile; purpose; modal choice; trip frequency and trip stages

A simple disaggregation of the travel data does not immediately indicate gender differences. As per the expanded data 51.95% are trips made by females, and 48.05% are trips made by males. Women spend an average of 33.23 minutes per trip, while male have an average trip of 36.91 minutes. By themselves these data suggest that women are not constrained by the urban space or available transportation.

However, the results are significantly different once the data is analyzed within a spatial frame facilitated by geo-referencing all the trips.

Gender and Mobility – the difference is the speeds

Controlling for mode of transport, a spatial analysis immediately points to a key difference between the travel patterns of men and women in Buenos Aires – a difference in travel speeds. Though average travel times for men and women are not that different, the distance men travel in that time is much longer than the distances that women are traveling. Indeed, the similarities in the average travel times in the population mask a significant difference between trip lengths: 6.72km for men and 4.77km for women. Net travel speeds, estimated by dividing the travel distances by the travel time illustrate this difference more clearly: 8.62km/hr for women and 10.93km/hr or 26.8% percent higher for men. As Figure 1 shows, this result is particularly pronounced in the case of people with children in the labor force: working women with children travel at speeds (9.7km/hour) that are 22 percent slower than those of similar men (12.2km/hour). Additionally, the largest speed differences are found when comparing working men and women with children.

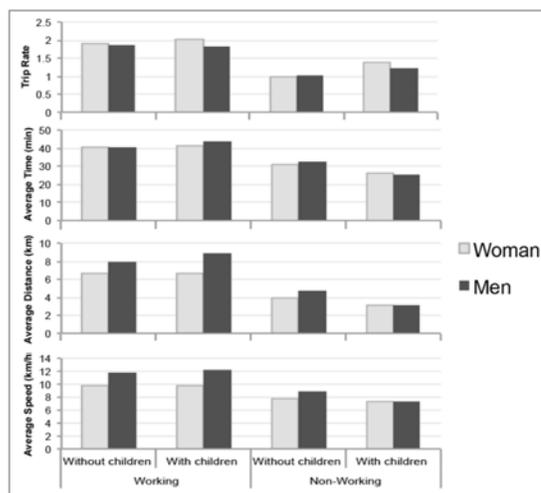


Figure 1. Trip rates, times, distances and speeds for working and non-working men and women. All Trips. ENMODO 2009. Expanded Survey

Figure 2 shows that mode of travel is an important source of some of these differences in speed. Particularly, the figure shows that women have a larger share of walk trips than men, while men make more automobile trips. Men and women make similar number of trips on transit, although women seem to travel more by bus while men use more rail services. As seen from the modal split, working men in this

group have a larger share of auto trips, while women utilize a larger share of the transit modes.

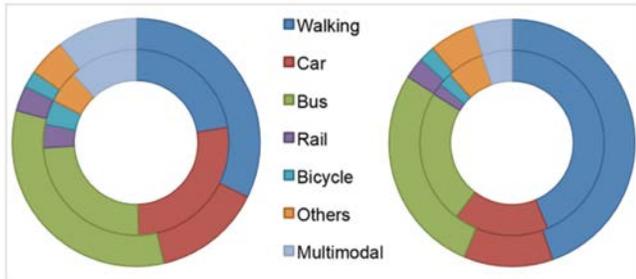


Figure 2. Modal Split for Men, Women (left), Working Men and Women with children (right). Women shown in inner ring. ENMODO 2009. Expanded

There are also systematic differences in trip rates between segments – as would be expected individuals in the labor force have significantly higher trip rates than individuals outside the labor force; and individuals with children have higher trip rates than those without. Women with children have higher trips rates than corresponding men – a difference that is consistent across individuals within and outside the labor force – consistent with the findings of other work (Vaconsellos, 2001) that finds that regardless of whether they are in the labor force, women shoulder a larger share of household responsibilities (and thus related trips) than do men. (see Box 1)

Figure 3 displays the hourly number of trips made by men and women throughout the day, presented by trip purpose. Non-working women appear to be traveling more during the day, a difference that is most prominent in the middle of the day. Furthermore, non-working women make most of the mid-day trips and would be most affected by the limited frequency of public transportation services at off peak times. Most of these trips made by women and men are not work, school or shopping trips; it appears that most of the trips are running errands for the household, dropping kids and social visits.

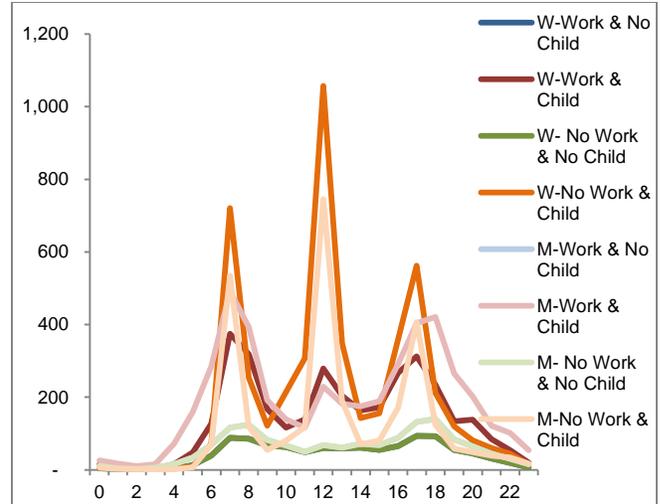


Figure 3. Number of trips (in thousands) for women and men according to trip purpose. ENMODO 2009. Expanded

Box 1: Trip Rate Differences

A number of research endeavors (Bianchi et al 2000; Artis et al 2003; Cunningham 2007) have focused on the division of labor between men and women. Since most of the trips in the survey area are single stage trips, our data did not display the trip chaining difference between men and women that is substantiated in other evidence¹; however, studying the daily trip rates of each gender, the data indicates that the women is carrying a larger travel burden. Table 1 displays the differences in trip rates for men and women. The data shows that women’s daily travel complexity is larger than her male counterpart, regardless of their employment. Furthermore, as women have children, she will likely bear a larger part of the travel burden brought about by the child.

Table 1. Differences in daily trip rates by employment status type and sex. ENMODO 2009. Expanded Survey

	Difference (F-M)	F:M Ratio
Working w/o Children	0.05	1.03:1
Working with children	0.17	1.09:1
Not working w/o children	-0.04	0.96:1
Not working with children	0.15	1.12:1

Once a family decides to have children the travel burden of trips is taken on by the woman in the household, increasing from 1.57 daily trips to 1.78. While men’s trips stay constant at 1.73 with or without

¹ Most trips in Buenos Aires are single stage trips. Women’s trips have on average 1.14 stages, while men’s trips have 1.15 stages.

children.

These differences increase when focusing on trips that are not the daily home to work commute for women and men between the ages of 18 and 65, Table 2, the findings indicate a much larger travel complexity for women than men. Daily trip rates increase substantially when women have children, carrying a larger burden of the household travel needs. These results are corroborated by new evidence (Taylor, B. 2013) that demonstrate that women in comparable household types make substantially more child-serving trips than men.

Table 2: Differences in non HBW daily trip rates by household type and sex. ENMODO 2009. Expanded Survey

	Difference (F-M)	F:M Ratio
Single, no kids	0.17	1.19:1
Single adult, with kids	0.84	4.76:1
Two adults, no kids	0.37	1.7:1
Two adults, with kids	0.86	2.75:1

Work Trips, Transport Access and Labor force outcomes

Work trips follow a broadly similar pattern: women travel shorter distances in about the same amount of time as men. This is particularly the case with women with children who on average have about the same commute times but work at locations about 20 percent closer than equivalent men.

Table 3. Travel times, distances and speeds for work trips for men and women. Work Trips. ENMODO 2009. Expanded Survey

	Average Time (min)	Average Distance (km)	Average Speed (km/hr.)
Women w/o Children	45.3	7.50	9.92
Men w/o Children	43.3	8.67	12.01
Women w/ Children	47.7	7.92	9.98
Men w/ Children	48.7	9.96	12.27

In other words, women with children in the labor force are finding jobs on average in a commute shed within a radius 20 percent lower than corresponding men. This smaller commute shed could translate to as much as 900,000 of fewer jobs.²

² If jobs were distributed evenly across the landscape – a 20 percent lower radius would translate to 36 percent fewer jobs. Given the distribution of employment and population in

Further exploring of the relationship between travelling speed for work trips of men and women in different income quintiles reveals that the differences in average travel speeds to work is consistent across income quintiles – indeed it most pronounced for quintiles 3 & 4 (perhaps reflecting higher auto-use by men in these quintiles – see Box 2).

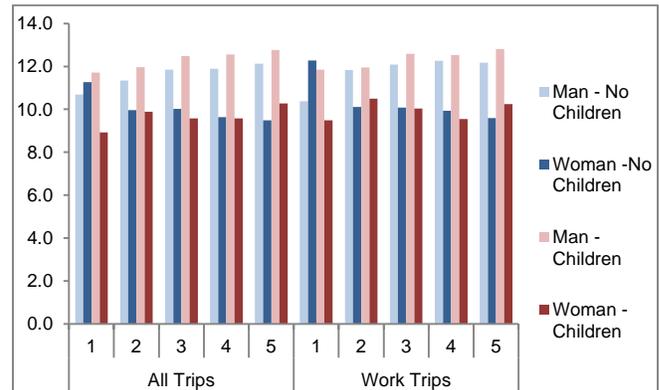


Figure 4. Trip Speeds for working men and women for different quintiles. ENMODO 2009 - Expanded Survey

The question of particular interest is whether these findings reflect an accessibility constraint: is it the case that women are looking for work opportunities in a much smaller commute-shed, possibly settling for sub-optimal jobs at the edge of their 'travel-time budgets'? While these data do not allow for a conclusive analysis – there are several mutually reinforcing suggestive pieces of evidence that suggest that this is so. First, those women seem to combine their work travel with a disproportionate number of non-work trips (Figure 3) and associated spatial/temporal constraints. Given that such trips are made off-peak/off-trunk routes that have lower levels of public transport service; and given that tariffs in Buenos Aires are charged per trip on any mode; it is not as surprising that such non-work trips are generally slower than work trips reflecting a combination of walking and feeder services (Figure 2). Moreover, that when a car is available men are much more likely than women to use it (see Box). This need to address non-work related responsibilities (related to shopping/other household needs, child care or care for other household dependents and the mobility constraints these trips impose maybe leading to women limiting

the Buenos Aires region; this translates to between 20% and 80% less jobs. The accessibility differences in employment opportunity are further explored in Figure 7 and 8.

themselves to smaller commute-sheds when looking for jobs.

Note that the similarity of men and women's average commute time is consistent with the travel-time budget hypotheses (WBCSD 2001, Kwan, 2000a, 2000b the evidence that average commute *times* across societies and income levels remains quite stable. Indeed, if average travel speeds for women go up to equal those of men and average travel times remains the same this opens up more opportunities in the labor market; anywhere from 20% to 80% more jobs on average (furthered explored).

If women were indeed constrained to smaller commute-sheds than men in identifying jobs; it would affect wage rates and related labor market outcomes.

Note that these findings could have other explanations. It is possible that women across the greater Buenos Aires region have per-chance been able to optimize work opportunities closer to home than men – and then made mode choices that result in similar average travel times. It is also possible that that households are making housing decisions in proximity to a woman's job and the shorter commute distances for women reflect no more than that dynamic.

Further research with better data will be needed to settle this question definitely.

Box 2: The impacts of auto ownership

Figure 5 displays the modal split of men and women with different levels of auto ownership. This figure highlights that men tend to travel more in cars the women. What we find is that as households acquire their first car, it is the men in the family that starts using it for their travel. It is not until families buy their second car that women start to use at a rate comparable to men. Women constantly have a higher use of public transportation as well as walking. It is interesting to note the house of 0 cars still have a substantial auto modal split for the trips (does not include taxis).³ This finding is confirmed also by an

³ This would suggest that people are travelling as auto passengers for large number of the trips. Men have a higher rate of auto trips even in households with zero cars. We can speculate that this is because they are traveling to places that are a common destination at common times. Women on the other hand are probably traveling to different locations

analysis of travel speeds – that reveals that working women's speed is unaffected by the first auto in the household, while the traveling speed for men increases. It is not until a household acquires their second car that the travel speeds for women increases

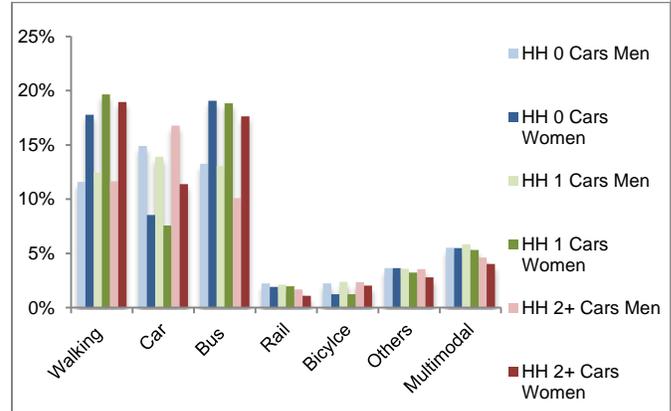


Figure 5. Modal Split for Men and Women with different automobile ownership, Enmodo Survey. ENMODO 2009. Expanded

Focusing on work trips we find that women are geographically limited to a smaller number of opportunities and jobs due to their slower travel patters. Figure 6 displays the differences in speed between auto and non-auto trips for men and women traveling in auto and other modes. When women have a car accessible, which they rarely do, their travelling speed increases by 5.76 km/hr, which indicates that in the same amount of time, they would be able to access a larger amount of employment opportunities.

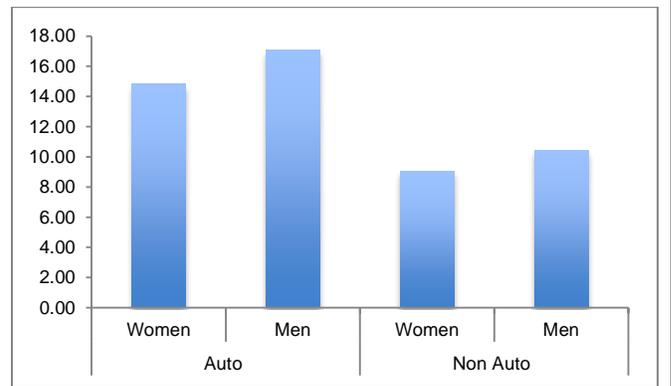


Figure 6. Travel speed for auto and non-auto work trips for men and women, Enmodo Survey. ENMODO 2009. Expanded

and at different times that once again highlights the complexity of their travel.

Employment accessibility by gender

The understanding of accessibility explains the link between transportation and urban relations. Accessibility measures the number of activities (e.g. jobs) available at a given distance from an origin (e.g. the home) and discounting that number by the intervening travel time (Hansen 1959; Levinson 1998). The research on accessibility is best summarized by the details it includes: the spatial distribution of opportunities, the mobility provided by the transportation system, the temporal constraints of individuals and activities, and the individual characteristics of people.

Differences in travel distances and time between men and women limit the number of accessible jobs for each. Figure 7 represents the increased employment accessibility of men with children relatively to women with children⁴. It is interesting to see how this unequal access to employment opportunities is distributed spatially. In some areas, the shorter distances don't imply a massive decrease in employment accessibility either because a large number of jobs are available nearby or because travelling a bit further does not drastically increase the number of available jobs. In other places however, the 25% increase in distance travelled represents a very large difference in terms of employment opportunities. Altogether, it can be seen from the map that this difference in average commuting distances translates overall in much larger differences in employment opportunities.

⁴ A number of caveats need to be mentioned. This map uses average commuting distances, whereas these are likely to be spatially dependent. Second, the commuting distances interpreted here are the straight-line distance. An increase in commuting distances, utilizing this distance calculation method will yield larger job accessibility inequalities than if these commuting distances accounted for the real transport network. Third, all employment opportunities and households are supposed to be located at the center of the radio they belong to. Some of the radii are indeed quite large, where travelling from one radius center to another can go beyond the 7.92km commuting distance for women with children. This can create a threshold effect that would overestimate the inequalities between men and women. This map should therefore be interpreted with caution and for illustrative purposes only, not as hard evidence.

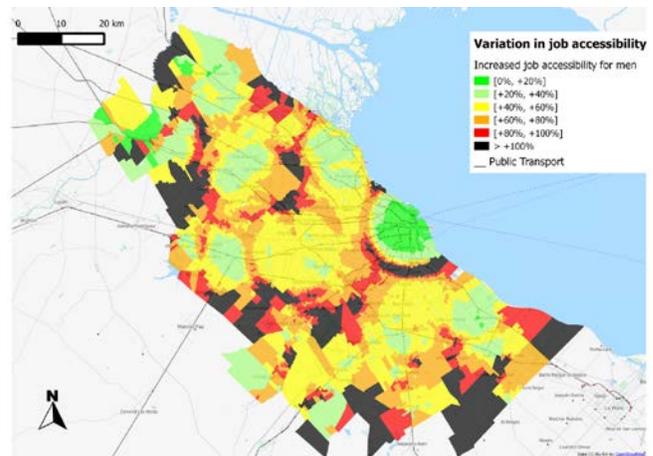


Figure 7: Percentage of increased accessibility to employment opportunities for men without children relatively to women with children at the radio census level in the AMBA region. Data sources: Logit, background map layer: OpenStreetMap, processed by CIRED

The spatial pattern of the differences in magnitude of the unequal job opportunity is not obvious. It is however easy to see that very large differences in job opportunities (>80%) between child men and women with children exist in various parts of the urban area. This results both from low numbers of jobs available locally and the existence of employment opportunities in adjacent radios which without necessarily giving access to many more jobs will change the results in relative terms. In the city center (mainly CABA), job accessibilities are quite equally distributed as there are large numbers of jobs available locally.

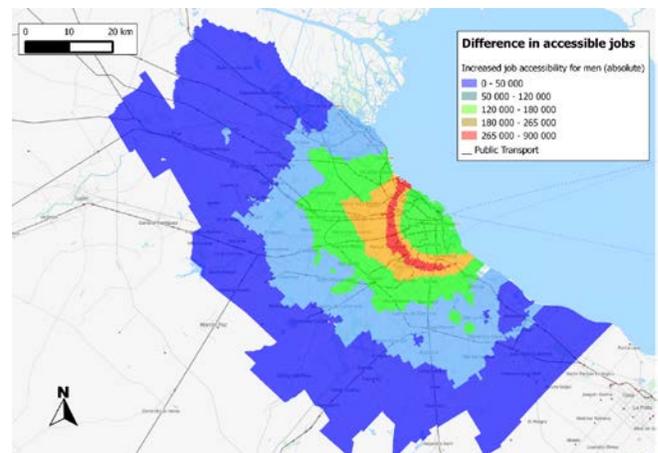


Figure 8: Absolute increase accessible employment opportunities for men with children relatively to women with children at the radio census level in the AMBA region. Data sources: Logit, background map layer: OpenStreetMap, processed by CIRED

Figure 8 shows a very different spatial pattern. As there are many less job opportunities in the outskirts of the AMBA region, absolute differences in job

opportunities seem to indicate less inequality far from the city centre. Although we believe that Figure 7 is a better measure for inequality in job access between genders because what counts most is relative and not absolute accessibility, this map is a useful complement.

Limitations and discussions

As noted, our data do not allow us to tell if the differences in travel distance reflect a constraint or a choice. There is much that suggests that these differences reflect a constraint: the differences are statistically significant and correlated with well-known differences in travel patterns (complexity of women's trips and lower access to auto). Moreover, the parity in travel for working trips between men and women echoes findings in the 'travel-time budget' literature which suggests that there is there is an inherent gender bias in the accessibility to urban opportunities (e.g. jobs) evident once we start to study the limitations of time and space (Kwan, 2000a, 2000b). Women travel times for work trips are equal to their male counterparts, but their reduced speed allows a limited access to jobs. The prevalence of this finding over different study groups suggests that the reduced speed for women acts as a constraint rather than choice. Regardless of the various groups that we study, the patterns continue to show that women have higher trip rates, and travel at lower speeds. Not only that, but middle-income women (in quintiles 3 and 4) with children have the largest mobility disadvantage. The pervasiveness of these results and the trends found amongst different study groups suggests that the transportation network and options does not serve women and men equally.

Still there remains a need for follow up research to identify the reasons underlying the differences as well as identify consequent labor market impacts. This research also suggests that there is an inherent gender bias on how public transportation systems are designed. Transit services are commonly designed to serve the peak am and pm times. However, as it is seen from the patterns in Buenos Aires, the largest share of transit trips are made by women for non-working purposes during the entire day. Women are limited in their accessibility to the city and to labor opportunities due to the complexity of their daily travel and their slower travelling options.

Moving forward, these findings suggest some avenues for future inquiry as well as some considerations for policy makers.

From a research perspective, two priorities emerge:

- First, the need to definitely understand the reasons underlying the difference for the mobility disadvantage.
- Second, there is a need to conclusively characterize the manner in which and the degree to which the complexity of women's travel needs constrain their labor market choices. A combination of qualitative, time-series and quantitative methods could help to both confirm and understand the causality underlying the findings of smaller commuted for women.

For policy makers there are four issues of interest.

- First, the degree to which **mobility systems can be adapted** more to the needs of women – in terms of providing higher quality of mobility off-peak/off-trunk routes. Supporting infrastructure and a culture for bicycling could be part of such a solution. A critical evaluation of public transport routes and services to be more supportive of such trips is also needed. Finally there is value in considering innovative tariff structures such as free transfers (particularly for trips with short breaks to run errands); and monthly/weekly/daily passes that are better suited to the travel needs of women.
- Second, the degree to which the constraints posed by non-work travel needs can be addressed. **Co-locating retail, child and health care as well as municipal services (bill payments etc.) at transport hubs** in particular can lower the penalty associated with such responsibilities, which in this case disproportionately seem to be women.
- The third issue to consider is the role that **cars may be playing in lowering gender-related constraints**. To the degree that mobility related demands and a lack of adequate mobility services is a constraint, the car is often the best solution. As the data indicated,

gender differences in commute speeds and distances are reduced when women have access to a car. As policy makers in Buenos Aires and elsewhere struggle with the negative impacts of cars – congestion, pollution, crashes – this work highlights the particular advantage of cars have to help address the particular off-peak/off-trunk route travel needs of women.

- Finally, there is a need to **develop an evaluation framework** that allows both for assessing the social and economic cost of gender-oriented mobility constraints as well as evaluating alternative the benefits and efficiency of alternative solutions that could address these constraints.

Acknowledgments

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Works Cited

Anand, A., and Tiwari, G. (2006) A Gendered Perspective of the Shelter–Transport–Livelihood Link: The Case of Poor Women in Delhi. *Transport Reviews*, Vol. 26, No. 1, 63–80, January 2006

Artis, J. E., and E. K. Pavalko. (2003) Explaining the Decline in Women's Household Labor: Individual Change and Cohort Differences. *Journal of Marriage and Family*, Vol. 65, No. 3, pp. 746-761.

Bianchi, S. M., M. A. Milkie, et al. (2000) Is Anyone Doing the Housework? Trends in the Gender Division of Household Labor. *Social Forces*, Vol. 79, No. 1, pp. 191-228.

Cattan, N. (2008), "Gendering mobilities: insights into the construction of spatial concepts", in Tanu Priya Uteng and Tim Cresswell (editors), *Gendered Mobilities*, Ashgate Publishing, 270 pages.

Cunningham, M. (2007) Influences of Women's Employment on the Gendered Division of Household Labor Over the Life Course: Evidence From a 31-Year Panel Study. *Journal of Family Issues*, Vol. 28, No. 3, pp. 422-444.

ENMODO 2009-2010. Resultados de la Encuesta Origen Destino. Movilidad en el Area Metropolitana de Buenos Aires

ENMODO 2009. Bases de Encuesta Origen Destino. Movilidad en el Area Metropolitana de Buenos Aires

Hansen, W.G.(1959). How accessibility shapes land use. *Journal of American Institute of Planners*, 25 (1), 73-76.

Kwan, MP. (2000a). Gender differences in space-time constraint. *Area* 32(2):145-156.

Kwan, MP. (2000b) Evaluating Gender Differences in Individual Accessibility: A Study Using Trip Data Collected By the Global Positioning System

Lefebvre, Henri (1996), *Writings on Cities*, translated and edited by Eleonore Kofman and Elizabeth Lebas, Blackwell Publishers, 264 pages.

Levinson, D. (1998). Accessibility and the journey to work. *Journal of Transport Geography* 6(1), 11–21.

Levy, C. (2009), "Gender justice in a diversity approach to development? The challenges for development planning", (Viewpoint), *International Development Planning Review* Vol 31, No 4, December, pages i–xi.

Levy, C. (2013), Travel choice reframed: "deep distribution" and gender in urban transport, *Environment and Urbanization* April 1, 2013 25: 47-63

Lucas, K. (2011), "Making the connections between transport disadvantage and social exclusion of low-income populations in the Tshwane region of South Africa", *Journal of Transport Geography* Vol 19, pages 1320–1334.

Mokhtarian, P., Chen, C. (2003) A Review and Analysis of the Empirical Literature on Travel Time (and Money) Budgets

Peters, Dieke (2002) Gender and Transport in Less Developed Countries: A Background Paper in Preparation for CSD-9. Background Paper for the Expert Workshop "Gender Perspectives for Earth Summit 2002: Energy, Transport, Information for Decision-Making" Berlin, Germany, 10 - 12 January 2001

Taylor, B., Ralph, K., and Smart, M. (2013) What Explains the Gender Gap Schlepping? Testing Various Explanations for Gender Differences in Household-Serving Travel. Paper submitted for presentation at the 2013 Annual Meeting of the Transportation Research Board 2013

Vasconcellos, E (2001), Urban Transport: Environment and Equity: The Case for Developing Countries, Earthscan, London and Sterling VA, 333 pages.

WBCSD (2001) Mobility 2001: World mobility at the end of the 20th century