

Gender Roles, Accessibility, and Gendered Spatiality

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Abstract : This study attempts to elucidate manifold dimensions of gendered accessibility experiences. How gender roles (household responsibilities) differentiate accessibility experiences between women and men is explored through the comparison of married dual-earner couples' parental status, using the US Portland activity-travel diary dataset with GIS-based geocomputation results of (time-geography based) space-time accessibility. First, this study shows how gender division of labor within the household still permeates current society, despite the widespread belief of the social change toward a gender-egalitarian society. Then, the study pays special attention to the way gender roles structure individual accessibility experiences of women and men differently, and, in turn, the way such accessibility experiences take a form of gendered spatiality. Gendered spatiality is examined through the analysis of accessibility space as well as activity space in order to ascertain women's home-attached and spatially entrapped characteristics. More household responsibilities throughout a day and, even more, the time constraint of picking up children at the daycare centers after work lead women's possible activity space to be more home-centered. The analysis of the spatio-temporal context of accessibility space makes gendered spatiality visible. However, the findings suggest that behavioral outcomes should be understood with an explicit awareness of constraints individuals face. It is because the revealed activity spaces can be not only an outcome of constraint but also an outcome of choice. Behavioral outcomes should not be treated as a straightforward expression of the level of constraints. It is problematic to expect that behavioral outcomes directly mirror the level of constraints. It is also problematic to suppose that the level of constraints can be straightforwardly elicited from revealed behavioral outcomes.

Key Words : gender, gender roles, accessibility, spatiality, household responsibilities, activity space, accessibility space, time-geography

요약 : 본 연구는 젠더차별적인 접근성 경험의 다양한 측면들을 규명하고자 한다. 사회적으로 구축된 성역할이 어떻게 남성과 여성 간의 접근성 경험을 다르게 만드는가를 특히 자녀를 가진 맞벌이부부의 비교를 통해 다루었다. 미국 Portland 지역의 개인통행데이터 및 시간지리학에 토대를 둔 시·공간 접근성의 GIS기반 지오컴퓨테이션 결과를 이용해 경험적 분석을 수행하였다. 첫째, 성평등적인 사회로 변하고 있다는 일반적 기대와는 달리 가정 내 성별 분업은 여전히 지속되고 있음을 알 수 있었다. 다음으로는 성역할이 여성과 남성의 접근성 경험을 차별적으로 구조화하는 방식과 그러한 접근성 경험이 다시 젠더화된 공간성의 형태를 띠게 되는 방식에 대해 살펴보았다. 젠더화된 공간성, 특히, 집-중심적이고 공간적으로 제한적인 여성의 특징을 활동공간 및 접근성공간의 측면에서 분석하고, 그 양자간의 관계에 대해서도 살펴보았다. 남성 배우자보다 많은 가사 부담과, 더 중요하게는, 퇴근 후 탁아시설/학교에 가서 자녀를 데려오는 행위의 시간적 제약이 여성의 가능한 활동공간을 보다 집 근처로 제한하고 있음을 알 수 있다. 접근성 공간의 시공간적 맥락 분석은 젠더화된 공간성을 잘 드러내주고 있다. 그러나 본 연구는 행위결과는 개인이 직면하고 있는 제약들에 대한 명확한 인식 속에서 이해되어야 한다는 점을 지적하고자 한다. 실현된 활동공간은 제약의 산물일 수도 있지만, 또한 선택의 결과물

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일 수도 있기 때문이다. 행위결과를 제약수준의 직접적인 표현으로 취급해서는 안 된다. 행위결과가 제약수준을 그대로 반영한다는 기대나, 발현된 결과로부터 제약수준을 그대로 유추해낼 수 있다는 가정은 문제가 있다.

주요어 : 젠더, 성역할, 접근성, 공간성, 가사책임, 활동공간, 접근성공간, 시간지리학

1. Introduction

Women and men are differently situated in society. Socially constructed expectations on gender have real effects on how women and men live their lives. One of the influential perspectives which address the significance of gender roles on women's lower access to urban opportunities is so called 'household responsibility thesis (HRH)' (Johnston-Anumonwo, 1992). In spite of women's increased workforce participation and the general beliefs of social change toward a more egalitarian society, many studies have found that traditional gender roles and expectations (i.e. women doing housework at home and men working in the labor market) still permeate. According to the HRH, "employed women tend to have greater household and child-care responsibilities and, as a result, face greater time constraints and ultimately choose shorter commutes than employed men" (Turner and Niemeier, 1997). Studies on the associations between gender roles, household responsibilities, and access to urban opportunities have overly focused on commuting distances/times -- an indirect measure of access to job opportunities (for thorough reviews, refer to Turner and Niemeier (1997)). The spatial entrapment (Nelson, 1986) or containment thesis emphasizes the aspect of gendered spatiality associated with women's heavier household responsibility and shorter commuting distances. Not only do a smaller time-budget and more complex space-time fixities due to household responsibilities result in shorter commutes; women's perceived

obligations do, also. Hanson and Pratt (1990) showed that women's shorter commutes are associated with household responsibility: marital status and the presence of children do affect women's journey to work lengths significantly, whereas not so for men. Socially defined gender roles make working mothers consider close proximity of work to childcare and/or school in case of emergencies; and job hours which fit with the school schedule and/or childcare arrangements as important job attributes, while men comparatively do not. Having a primary responsibility for household work, working mothers want to be able "to get home quickly for kids, emergencies, family reasons" (Hanson and Pratt, 1990).

While most studies have found some support for the household responsibility hypothesis and spatial entrapment thesis through analyzing actual travel/activity patterns, few studies have examined the hypotheses with respect to accessibility measures. In this regard, this study will provide a useful insight on gender differences in accessibility through exploring the relationship between household responsibility, activity space, and accessibility space.

More specifically, first, this study will explore whether and how so-called socially-constructed gender roles influence everyday experiences of men and women differently, even though each member of a couple lives in the same household with the same socio-demographic situation. Second, this study attempts to investigate how individual accessibility experience takes a form of gendered spatiality. Gendered spatiality has been predominantly examined in terms of activity

space (i.e. revealed travel distance from home to activities) (Dijst and Vidakovic, 2000). An alternative way of examining gendered spatiality will be suggested in this study with a critical examination of activity space. In other words, gendered spatiality will be examined in terms of accessibility space (possible activity space). While conventional indicators explaining gendered spatiality have concentrated their interests on the *actual* spatial extent of travels (spatial extent of *activity space*), the analysis in this paper will pay attention to the *possible* spatial extent of travels (spatial extent of *accessibility space*) as well. Conventionally, gendered spatiality has been identified through measuring travel distances from home to activity locations (discretionary activities or workplaces), travel distances between activities, and level of travels for, and participation in, non-work out-of-home activities. These widely used indicators are based on the assumption that women's circumstances of spatial entrapment (or spatial containment) and being home-attached would be exposed in a form of shorter and closer-to-home travels and less out-of-home activities than men. The applicability and usefulness of these indicators to grasp gendered spatiality will be critically examined. Besides these methods, another way of detecting gendered spatiality will be employed. Some previous conventional studies have been overly concentrated on the spatial extent of *actual activity space*, which could be a product of either individuals' choice or constraints. The spatial extent of *possible accessibility space* given space-time constraints, which women and men might face in a different way, can help to enhance our understanding of gendered spatiality. In the examination of gendered spatiality, taking into consideration accessibility spaces can help to enhance not only our understanding of gendered spatiality, but also of activity space *per se*.

Therefore, the purpose of this study is to understand how gender roles, household responsibilities, and accessibility affect and are affected by one another through the analysis of husbands and wives within the same households; and whether and how those factors result in gendered spatiality in terms of activity space and accessibility space. In Section 2, after looking at general characteristics of households of dual-earner couples, the importance of gender roles in shaping household responsibilities and accessibility will be examined. Then, the remaining sections will focus on how such gender role constraints differentiate accessibility experiences, more specifically in terms of spatiality, between husbands and wives in different parental status. Section 3 will analyze gendered spatiality through the analysis of activity space to examine women's home-attached and spatially entrapped characteristics (through the measure of travel distances from home and the amount of in-home and out-of-home activities). Then, gendered spatiality by accessibility space will also be taken into account in Section 4 and 5. Conclusions and discussions will follow after the relationship between the spatial dimension of accessibility experiences and revealed activity/travel behaviors is examined in Section 6.

For the analysis of gendered spatiality through the examination of accessibility, space-time individual accessibility measures instead of conventional spatial measures (i.e. gravity-type or cumulative-opportunities measures) are employed, which evaluate accessibility in terms of properties of space-time prisms constructed during a day. Using US Portland activity-travel diary dataset, the GIS-based geocomputation by the Kim and Kwan's algorithm (2003) is conducted in the Arcview environment. Conventional spatial measures of accessibility have been criticized as gender-blind in that they are not that suitable for examining women's

access to urban opportunities like jobs. This is because women's activity choices face additional time constraints due to their gender roles (heavy household-associated activities and child care activities), and also because such gender-role-related space-time constraints are more crucial than mobility itself (i.e. access to car) in determining women's job locations (Pickup, 1984; Tivers, 1985, 1988; Turner and Niemeier, 1997; Turner and Grieco, 2000; Kwan, 1999a, 1999b, 2000). As an attractive alternative measure, time-geography-based space-time accessibility has been recently taken attention (Villoria, 1989; Miller, 1991; Kwan, 1998, 1999a, 1999b; Weber, 2001; Weber and Kwan, 2002; Kim and Kwan, 2003; Kim, 2005a, 2005b). The space-time accessibility measures evaluate the level of space-time autonomy of individuals using the concept of space-time prisms determined by locations of activities to carry out, total amount of time available for travel and activity participation, and travel velocities (Hägerstrand, 1970; Burns, 1979). In order to examine gendered spatiality, space-time accessibility measures which sum up the number or area of urban opportunities within several space-time prisms made throughout a day are employed (for the detailed description of the way of calculations and properties of the measures, refer to Kim and Kwan (2003) and Kim (2005a)).

2. Household Responsibilities as Gender-role Constraints

A total number of 271 dual-earner married couples in Portland – therefore, 542 individuals within the 271 households where both husbands and wives are present in the data set – are selected from the Portland activity-travel diary dataset in order to examine how gender roles

render accessibility experiences in everyday lives that are different between husbands and wives even within the same households. Therefore, gender differences in accessibility and household responsibilities (domestic work and childcare) will be examined using the data set of the 542 individuals (271 dual-earner couples' households) who reported having cars available for trips throughout a day. In addition, to examine the effect of childcare-associated gender roles, couples with children under 18 years old are classified as mothers and fathers in this study. The sample data set is composed of 124 households with a dual-earner couple with children and 147 households without children. Besides, this sample data includes only Whites in order to control the effect of race. The residential location of these households in Portland Metro, US is shown in Figure 1.

Household characteristics of dual-earner couples in Portland in the sample are shown in Table 1. In the sample, the number of households with children is slightly less than that those without children. Most couples in parenthood tend to have one or two children. The predominant type of employment status is full-time, for both husbands and wives. Specifically, households where couples are both employed full-time are the largest group in the sample data (FF: 74.2%), followed by those with full-time employed husbands and part-time employed wives (FP: 19.6%). However, gender difference is found in terms of the proportion of part-time employment, which is found to be much higher for wives (21%), compared to husbands (6.3%). Moreover, in the case of couples with children, the percent of part-time employed wives is much larger than that of wives with no children (26.6% vs. 16.3%), while it is not the case for husbands (5.6% vs. 6.8%). So, the presence of children significantly affects wives' employment status but not husbands'. It can be

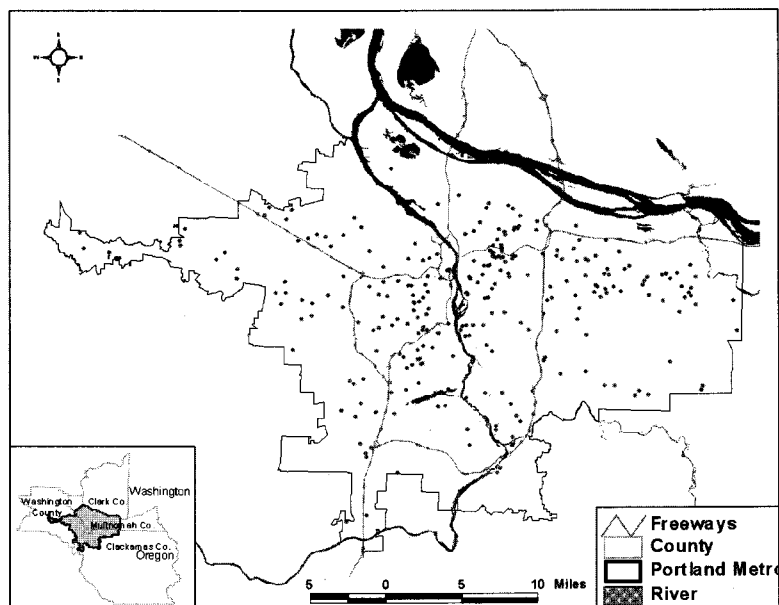


Figure 1. Portland Metro, US: Home locations of 271 households with dual-earner couples in sample

also seen from the fact that the percentage of couples with full-time working husbands and part-time working wives with children increases, compared to couples without children, while that for the couples with both employed full-time (FF) decreases. Thus, it can be said that the impact of parental status on employment status would be gender-dependent. It would imply that what leads women to be part-time workers may not be roles defined by the change of life stage (i.e. marriage, children), but rather gender roles socially defined for them as married women (wives and mothers), as indicated by the difference in changes in the percent of part-time employment by gender and parental status.

It is generally believed that marriage and parenthood increase one's physical and psychological burdens in terms of household responsibilities (such as household maintenance and childcare) (England, 1996). Along with paid-work hours at workplaces, the additional obligatory work hours for the home restrict individuals' discretionary time, and, in turn, their

accessibility to urban opportunities. Traditional gender role expectations are changing slightly, but still continuing in society. Obligatory activities associated with household-associated work are likely to be undertaken by wives more disproportionately than their husbands, regardless of women's employment status. In this regard, gender role constraints (household work hours) play a significant role in producing a gender gap in terms of the quality of life in general, and in terms of accessibility to urban opportunities specifically. Therefore, the level of accessibility is likely to be gender-dependent, as women are disproportionately heavily-laden with household responsibilities.

If accessibility is not significantly determined by gender roles, a husband and a wife in the very same conditions (the location of home within the urban environment and the presence of children) would be expected to have the same level of access to urban opportunities. Then, the difference in employment status would be the only significant factor making a difference. In this

Table 1. Household characteristics of dual-earner couples in sample in Portland Metro, US

Household characteristics with dual-earner couples			
		# of households	(%)
TOTAL		271	(100.0)
Parental status	No children	147	(54.2)
	Children under 18	124	(45.8)
	children under 12	64	(23.6)
	children under 6	30	(11.1)
Number of children	1	49	(18.1)
	2	51	(18.8)
	3	17	(6.3)
	4+	7	(2.6)
Employment status	Husband, Full-time	254	(93.7)
	Husband, Part-time	17	(6.3)
	Wife, Full-time	214	(79.0)
	Wife, Part-time	57	(21.0)
<i>Households without Children</i>		147	(100.0)
	Husband, Full-time	137	(93.2)
	Husband, Part-time	10	(6.8)
	Wife, Full-time	123	(83.7)
	Wife, Part-time	24	(16.3)
<i>Households with Children</i>		124	(100.0)
	Husband, Full-time	117	(94.4)
	Husband, Part-time	7	(5.6)
	Wife, Full-time	91	(73.4)
	Wife, Part-time	33	(26.6)
Employment status of husbands and wives *	FF	201	(74.2)
	FP	53	(19.6)
	PF	13	(4.8)
	PP	4	(1.5)
<i>Households without Children</i>		147	(100.0)
	FF	116	(78.9)
	FP	21	(14.3)
	PF	7	(4.8)
	PP	3	(2.0)
<i>Households with Children</i>		124	(100.0)
	FF	85	(68.5)
	FP	32	(25.8)
	PF	6	(4.8)
	PP	1	(0.8)

* Employment status of each household is indicated in an order of husband and wife.

F and P represent full-time workers and part-time workers, respectively.

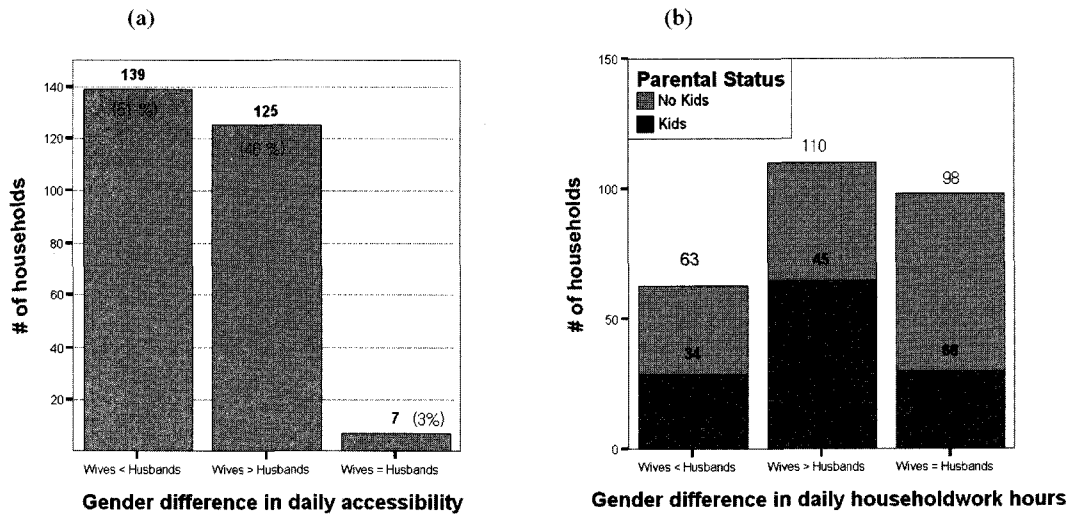


Figure 2. The number of households (a) by types of gender difference in daily accessibility (*WareaDur*); (b) by types of gender division of labor within household in terms of daily household work hours

light, as there are 40 more part-time employed wives than part-time employed husbands in the sample (Table 1), thus, more households can be assumed to have couples where a wife enjoys better access than a husband. However, this is not the case in reality. As shown in Figure 2(a), in more households, wives have lower accessibility than husbands, instead of better access. More specifically, while, due to a higher percentage of part-time working women than men among couples in the sample, wives' higher accessibility than husbands' (led by wives' shorter work hours at a workplace) might be generally expected. However, the actual level of wives' accessibility is found to be lower in most cases of the households investigated.

The missing link between the level of accessibility and the composition of employment status within households is gender role-induced, unequally distributed, household responsibilities by gender. That is, inequitably allocated household responsibilities to married women are another important axis shaping gender differences of individuals' daily accessibility

experiences.

The gender division of labor within the household in terms of daily household work hours spent by husbands and wives is shown in Figure 2(b). This gives some indications of the current status of changes in gender roles and gender relations within the household. Households where women are primarily responsible for most household tasks are still a typical type of household, as the number of households is the largest when wives spend more time on household work than their spouses. The percentage of women's longer household work durations than those of men is especially high among couples with children. Interestingly, the biggest group of households with couples without children is shown to share the household work burden equally. It might indicate that parental status is a stronger factor than marital status.

Therefore, wives' relatively shorter paid-work hours do not directly represent more space-time autonomy and thus higher accessibility. Contrary to general expectations, wives' longer household-

Table 2. Difference in household responsibilities between dual-earner couples by gender and parental status

	Total household work duration during a day		Number of household works		Average household work duration	
	Husbands	Wives	Husbands	Wives	Husbands	Wives
Total						
(N = 271)						
Mean	31.24	54.44	0.61	0.92	21.42	31.41
Std. Deviation	63.53	89.98	0.96	1.3	43.21	49.49
Mean Difference	-23.20**		-0.31**		-9.99**	
<i>Couples without children</i>						
(n = 147)						
Mean	26.91	34.43	0.42	0.52	19.8	24.97
Std. Deviation	63.2	64.37	0.79	0.95	44.16	47.33
Mean Difference	-7.52		-0.1		-5.18	
<i>Couples with children</i>						
(n = 124)						
Mean	36.37	78.17	0.83	1.39	23.34	39.03
Std. Deviation	63.79	108.67	1.09	1.49	42.16	51.08
Mean Difference	-41.80**		-0.56**		-15.69**	

** : Mean difference by gender is statistically significant at the 0.01 level (2-tailed).

Bold: Mean difference by parental status is statistically significant at the 0.01 level (2-tailed).

work hours tend to counteract the possibility of better accessibility experience with shorter paid-work hours. As a result, more wives are found to experience lower, not higher, accessibility than their spouses.

Additionally, Table 2 also shows that dual-earner couples experience significantly unequal division of labor within households in terms of the number and the duration (both total and average) of household-associated work. Married women spend 23.2 minutes more time on household work than their spouses: such a time difference is statistically significant. Also, wives have to carry out more household-associated activities throughout a day, and their average work duration required is longer than their husbands'.

It is noteworthy that the presence of children significantly intensifies the unequal division of labor within household by gender. Interestingly, the gender difference in household

responsibilities is negligible and even becomes statistically insignificant among dual-earner couples without children. Another notable finding from the result is that the effect of parental status on household responsibilities is quite gender-biased. Overall, couples with children spend a longer time on more household work than those without children. However, the amount of the increase, and its significance, in household work burden by parental status is clearly different by gender. For example, women with children carry out more household-associated activities than those without children (1.4 activities during a day vs. 0.5), and spend about 40 minutes more on those tasks (78.2 minutes vs. 34.4 minutes). Unlike women, men with children, however, do not experience a large increase in either total or average household work duration or frequency of household work, compared to men without children.

In summary, it is found that wives encounter

significantly heavier household responsibilities than their spouses. Gender difference in terms of the division of labor within households is found to be significant among couples with children, not among couples without children. Couples without children tend to show the moderately equal division of labor within households. In this regard, for dual-earner couples, marital status itself might not be a crucial factor as much as parental status in shaping gendered division of household labor. Moreover, the intensification of household responsibilities by a change in parental status is found to be much greater for women, compared to men. Household responsibilities can be considered as gender role constraints. Gender difference in the frequency and duration of household work would make women stay longer at home and travel more from/to home, which renders the spatial characteristics of women's accessibility home-centered and home-oriented.

3. Gendered Spatiality in terms of Activity Space

There have been considerable studies on women's limited spatiality as compared to men's (Tivers, 1985; Palm and Pred, 1978; Pickup, 1884; England, 1988; Hanson and Pratt, 1995). Women are often considered as 'spatially entrapped' or 'home attached.' Gendered spatiality has been largely studied in terms of activity space. Using different measures, gender difference in the use or usability of space has been identified. To demonstrate such gendered spatiality, travel distance to activities from home, or the level of out-of-home activities have often been utilized as useful indicators. These methods are based on assumptions of either women's preference (choice) for shorter travels, their limited mobility

(lack of access to cars), or their space-time constraints which stem from gender roles. Basically, previous studies have found women travel shorter distances, travel to activities close to home, participate in less out-of-home activities, and spend more time at home), which are evidence of gendered spatiality – as pointed out by the well-known 'spatial entrapment,' 'spatial containment,' or 'home-attached' thesis on women's situation.

1) Participation in out-of-home activities

One of the forms of gendered spatiality which previous studies often pointed out is women's higher likelihood of staying at home for household work activities and their lower level of participation in out-of-home discretionary activities as a result. Are women really home attached? One of the limitations of previous studies on women's home attachment is that analyses tend to draw conclusions simply from one side of the findings. In other words, when women's higher level of in-home household fixed activities are empirically identified, it is often thought that their level of out-of-home flexible activities can be straightforwardly elicited. Or, it is generally assumed that the empirical evidence of women's fewer out-of-home flexible activities may represent women's heavier household responsibilities. There are few studies which examine women's home attachment through considering both sides of women's activity patterns, in-home and out-of-home simultaneously.

Another limitation of previous studies is that in-home activities have often been ignored as a location choice for flexible activities and improperly assumed as a mere location constraint for fixed activities. Despite the fact that home is also a center of a wide variety of activities, all in-home activities are often treated as if they were a

Table 3. Gender differences in number of activities by location by fixity type

# of activities performed during a day by location by fixity type								
	Husbands				Wives			
	Subtotal	Fixed activities (%)	Flexible activities (%)	Subtotal	Fixed activities (%)	Flexible activities (%)		
Total	1,773	722 (40.7)	1,051 (59.3)	1,874	819 (43.7)	1,055 (56.3)		
(%)	(100)	(100)	(100)	(100)	(100)	(100)		
out-of-home	887	573 (64.6)	314 (35.4)	932	600 (64.4)	332 (35.6)		
(%)	(50.0)	(79.4)	(29.9)	(49.7)	(73.3)	(31.5)		
in-home	886	149 (16.8)	737 (83.2)	942	219 (23.2)	723 (76.8)		
(%)	(50.0)	(20.6)	(70.1)	(50.3)	(26.7)	(68.5)		
<i>Parental status</i>								
No children	961	377 (39.2)	584 (60.8)	981	395 (40.3)	586 (59.7)		
(%)	(100)	(100)	(100)	(100)	(100)	(100)		
out-of-home	482	301 (62.4)	181 (37.6)	497	302 (60.8)	195 (39.2)		
(%)	(50.2)	(79.8)	(31.0)	(50.7)	(76.5)	(33.3)		
in-home	479	76 (15.9)	403 (84.1)	484	93 (19.2)	391 (80.8)		
(%)	(49.8)	(20.2)	(69.0)	(49.3)	(23.5)	(66.7)		
Children	812	345 (42.5)	467 (57.5)	893	424 (47.5)	469 (52.5)		
(%)	(100)	(100)	(100)	(100)	(100)	(100)		
out-of-home	405	272 (67.2)	133 (32.8)	435	298 (68.5)	137 (31.5)		
(%)	(49.9)	(78.8)	(28.5)	(48.7)	(70.3)	(29.2)		
in-home	407	73 (17.9)	334 (82.1)	458	126 (27.5)	332 (72.5)		
(%)	(50.1)	(21.2)	(71.5)	(51.3)	(29.7)	(70.8)		

single type – obligatory in nature, especially in a form of a household-serving activity. Alternatively, although a lot of out-of-home, non-work activities do in fact include obligatory activities, all out-of-home activities are often regarded as an indicator of an individual's level of freedom from space-time constraint.

Table 3 shows gender differences in the number of activities by location and by activity fixity type. Basically, married women tend to perform a greater number of activities during the day than married men (1,874 vs. 1,773), which is reasonably consistent regardless of activity locations and their parental status. Regarding activity fixity, the number of flexible activities undertaken during a day by a person is greater than that of fixed activities, for either women or men, with or without children.

What is surprising from the results is that unlike general expectations, wives undertook more out-of-home activities than husbands. Previous studies strongly believed that the greater the number of out-of-home activities, then, the better access to urban opportunities. According to these studies, due to heavier household responsibilities, women would have fewer out-of-home activities. However, this study shows that out-of-home activities are largely made up of *fixed* activities, not flexible activities, whereas in-home activities are largely made up of *flexible* activities, not fixed activities. Gender difference in the percent of fixed activities among out-of-home activities is negligible (64.6% for husbands vs. 64.4% for wives), which is consistent regardless of parental status. However, parental status tends to increase the percent of fixed out-of-home activities,

regardless of gender.

On the other hand, in-home activities are more likely to be flexible in nature, for both husbands and wives, regardless of parental status. Contrary to the case of out-of-home activities, there are gender differences in composition of fixity type for in-home activities – the percentage of flexible activities among in-home activities is higher for men than women. In the case of men 83.2% of in-home activities are flexible, in the case of women only 76.8% are flexible.

Parental status leads to the increase in ratio of fixed activities to flexible activities for both men and women (but, more sharply for women than for men). The increase in the relative importance of fixed activities is found in terms of in-home activities as well as out-of-home activities regardless of gender. In particular, women with children experience a dramatically increased percent of fixed activities among in-home activities (19.2% for women without children, vs. 27.51% for women with children), while men do not (15.8% vs. 17.94%).

These findings imply that gender roles generate more fixed activities at home onto women. Hence, the results suggest that gender expectations of parental status, rather than gender itself, makes people stay at home in general, and makes women more home-attached in particular. Parental status requires more household-associated obligatory activities, which forces people to be at home more. Since the share of household responsibilities within a household is still gender-imbalanced, women's relatively heavier household responsibilities compared to men's lead women to perform more obligatory activities at home.

At the same time, what needs attention is the fact that gender roles also make wives with children carry out more out-of-home household tasks, as shown in Table 4. Women undertake more household-related fixed activities than men

regardless of their parental status. For both men and women, most in-home fixed activities (approximately 60~70%) are household-related regardless of their parental status. However, it is worthy of note that women and men with children encounter a lot of household tasks which need to be accomplished *out of home*. Especially, women with children have approximately twice the number of household-associated activities than men, not only *in home* but also *out of home*. In addition, in terms of the number of activities, women with young children are not necessarily home attached, as the higher proportion of household work is undertaken out of home (52.6%) rather than in home (47.4%).

Hence, home should not be interpreted as simply a place for household responsibilities. In fact, home is also chosen for flexible activities by those who have enough time to participate in out-of-home activities. The percentage of those staying at home is quite gender-indifferent, and most in-home activities are flexible, not fixed. It should not be ignored that people stay at home, not just because they have no choice (which has been overemphasized by previous studies), but also because they want. Therefore, unawareness of the fact that the majority of out-of-home activities are fixed and that the majority of in-home activities are flexible would mislead interpretation of the gender difference in number of out-of-home activities. In this light, it calls for a critical re-examination of women's home-attachment. Gender role-associated household responsibilities oblige women not only travel to, and stay at, home, but also travel to locations other than home.

Staying at home itself could be for two different types of activities, either obligatory (spatially and/or temporally fixed) or discretionary (spatially and/or temporally flexible). Therefore, home as a location for activities could be both a constraint and a choice. More in-home activities

Table 4. Gender differences in number of fixed activities by location by activity purpose

Activity purpose	# of fixed activities performed during a day by activity purpose by location						
	Husbands			Wives			
	subtotal	(%)	out-of-home (%)	in-home(%)	subtotal (%)	out-of-home (%)	in-home (%)
Total	722 (100)		573 (100)	149 (100)	819 (100)	600 (100)	219 (100)
Household	202 (28.0)		104 (18.2)	98 (65.8)	303 (37.0)	146 (24.3)	157 (71.7)
(%)	(100)		(51.5)	(48.5)	(100)	(48.2)	(51.8)
Work	496 (68.7)		449 (78.4)	47 (31.5)	472 (57.6)	423 (70.5)	49 (22.4)
Personal	24 (3.3)		20 (3.5)	4 (2.7)	44 (5.4)	31 (5.2)	13 (5.9)
<i>Household without Children</i>							
Total	377 (100)		301 (100)	76 (100)	395 (100)	302 (100)	93 (100)
Household	85 (22.5)		39 (13.0)	46 (60.5)	109 (27.6)	44 (14.6)	65 (69.9)
(%)	(100)		(45.9)	(54.1)	(100)	(40.4)	(59.6)
Work	277 (73.5)		249 (82.7)	28 (36.8)	266 (67.3)	243 (80.5)	23 (24.7)
Personal	15 (4.0)		13 (4.3)	2 (2.6)	20 (5.1)	15 (5.0)	5 (5.4)
<i>Household with Children</i>							
Total	345 (100)		272 (100)	73 (100)	424 (100)	298 (100)	126 (100)
Household	117 (33.9)		65 (23.9)	52 (71.2)	194 (45.8)	102 (34.2)	92 (73.0)
(%)	(100)		(55.6)	(44.4)	(100)	(52.6)	(47.4)
Work	219 (63.5)		200 (73.5)	19 (26.0)	206 (48.6)	180 (60.4)	26 (20.6)
Personal	9 (2.6)		7 (2.6)	2 (2.7)	24 (5.7)	16 (5.4)	8 (6.3)

do not necessarily mean less ability to get out of the home. In addition, participating in more out-of-home activities (particularly, out-of-home non-work activities) does not necessarily mean higher access to urban opportunities. That is, out-of-home activity locations could also be both constraints and choices. In this regard, it is necessary to look at a more detailed picture of gender differences (especially in couples with children), specifically whether out-of-home activities and in-home activities are either flexible or fixed in nature.

2) The spatial extent of activity space

Past studies generally show that, owing to women's higher level of spatial and temporal fixity constraints which mainly stems from their dual roles, women have certain characteristics of travel behavior such as shorter travels in general,

travels closer to home or to workplaces, shorter journey-to-work distances compared to men, and therefore their activity spaces are expected to be much smaller and closer to home than men.

The results indicated by Table 5 tell that such expectations are not always justified. First of all, gender difference in travel times itself is turned out to be not statistically significant at all. Travel times from one activity to the next are not gender-dependent. Therefore, the finding in this analysis is against the assumption regarding women's shorter travel behavior. It implies that gendered spatiality is not necessarily characterized by women's short travel distances.

What about women's spatiality in terms of the extent of activity space? The spatial extent of activity space is generally considered as the travel distance from home to activities. Travel distance from home to work is also often used.

It is surprising that the activity space in terms of

Table 5. The spatial extent of activity space with respect to distances traveled

Travel distances between (in minutes)	Spatial extent of Activity Space					
			Couples without Children		Couples with Children	
	Husbands	Wives	Husbands	Wives	Husbands	Wives
Activity - activity	11.4	10.7	11.5	11.1	11.4	10.2
Home - activities						
- Flexible activities	4.5	4.4	4.5	4.9	4.5	3.8
- Fixed activities	14.3	11.0	14.6	12.6	13.9	9.6
<i>(Home - Work)</i>	22.6	19.6	22	20.4**	23.4	18.6**
- Total activities	8.5	7.3	8.5	8.0**	8.5	6.5**

Bold: Mean difference by gender is statistically significant at the 0.01 level (2-tailed).

Italic: Mean difference by gender is statistically significant at the 0.05 level (2-tailed).

** : Mean difference by parental status is statistically significant at the 0.01 level (2-tailed).

Note: All the travel times above are network-based, free-flow speed based. However, travel times for Home-Work are exceptionally congested-flow speed based.

average travel times from home to all flexible activity locations does not vary either by gender or by parental status. Discretionary activities were undertaken within a 5-minute travel distance on average, for either women or men, and with or without children. Similarly, the spatial extent for fixed activities is not statistically different between men and women.

Additionally, the examination of travel distances from home by activity purpose (as shown in Figure 3) clearly corroborates the idea that it is questionable that women are likely to travel shorter distances and engage in activities closer to home than men, which in turn results in women's spatially bound experience. Travel distances to all the types of activities except the workplace do not show that women significantly travel shorter distances from home than men. In most cases, the differences in distance are negligible, and for some activities such as shopping, personal services or appointments, women were found to travel even further than men.

Women's activity space from home to all activities, on the other hand, is found to be

smaller with a statistical significance (Table 5). Such gender differences in the spatial extent of all activities from home are true only for women and men with children. Another interesting gender difference found in such activity spaces is that for wives, parental status renders activity space significantly smaller (8.0 for women without children → 6.5 minutes for women with children), while for men, it makes no difference at all (8.5 → 8.5 minutes).

The spatial extent of activity space from home to workplace is the only type which shows statistically significant gender differences not only between couples with children, but also between couples without children. However, like the case of the home-all activities activity space, the change in parental status significantly further restricts the spatial extent of the activity space from/to the workplace only for women, not for men.

In short, it seems that travel distances imply no necessary relationship to gendered spatiality. Women's shorter travels or closer-to-home travels are found to be statistically insignificant, in general. Women's spatial entrapment is not

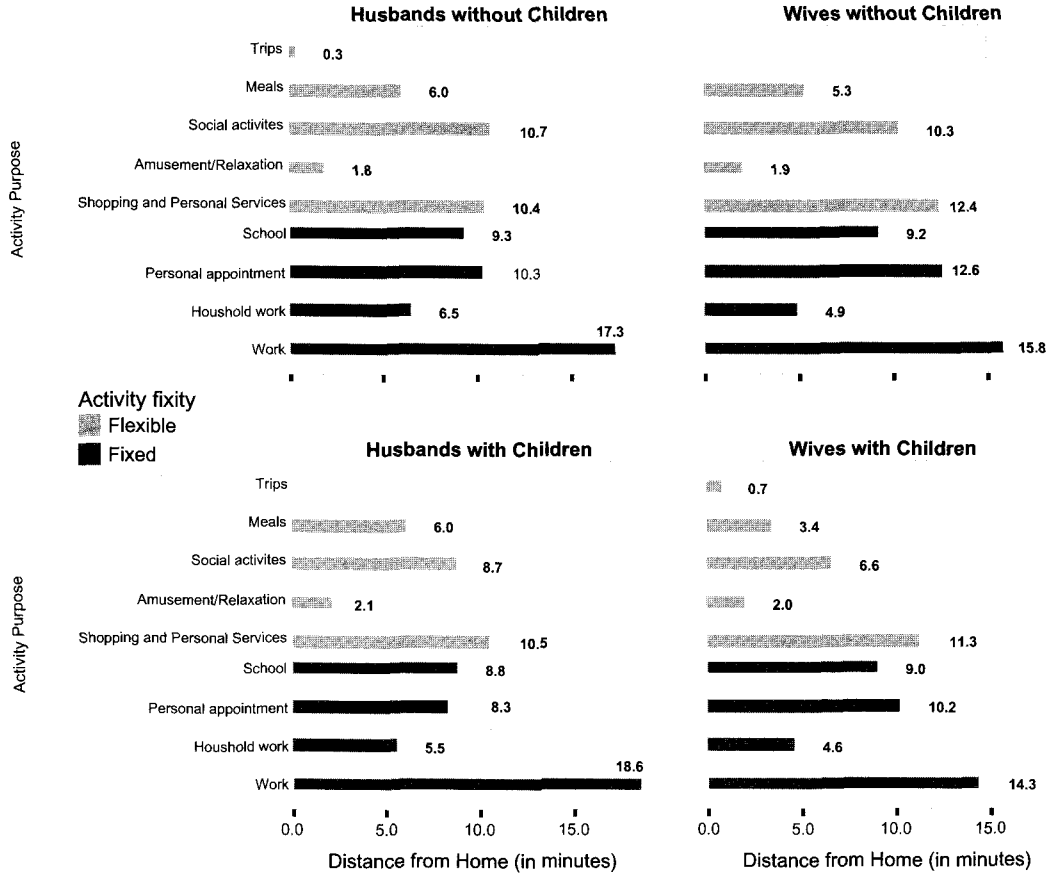


Figure 3. Travel distances by activity purpose by gender and parental status

Note: Travel times are based on free flow speeds for all activities.

readily identifiable through the examination of activity spaces, either. Gender differences in a form of compactness and home-centeredness of activity spaces are found to be statistically insignificant in most cases. Thus, it suggests that outcomes from conventional methods would need to be critically reexamined with caution.

Then, can the fact that women’s activity spaces, especially from home to flexible or discretionary activities, are not necessarily smaller compared to those of men be interpreted as evidence of the attenuation of gender inequalities stemming from gender role constraints? In other words, can we draw a conclusion of the equitable gender

division of labor within households, simply from an observation of no gender difference in actual activity space? This question will be answered in remaining sections with the examination of accessibility space.

4. Gendered Spatiality in terms of Accessibility Space

The literature on gendered spatiality concentrates on activity space (often in terms of actual travel distance or actual activity location

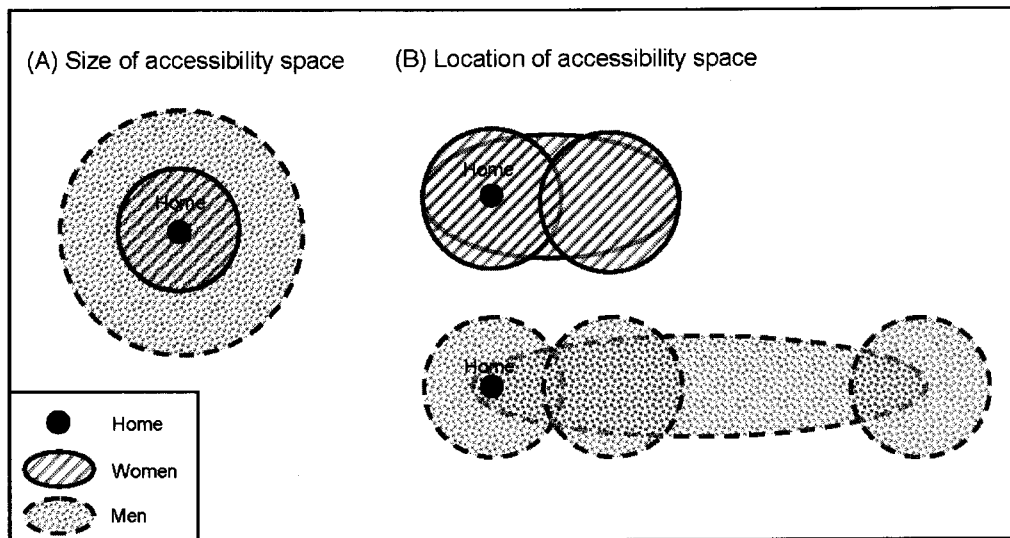


Figure 4. Two elements of accessibility space rendering gendered spatiality

choice). Accessibility space, or possible activity space, has received less attention. How long, when, and where people travel do not take place in a vacuum (therefore as a form of unconditional choice), but rather in a constrained situation in space and time. In this regard, it is worthwhile to examine gendered spatiality using accessibility space.

In order to identify gendered spatiality, two elements of accessibility space are explored: the average size of accessibility space, and the positional characteristics of accessibility spaces. Gendered spatiality can be manifested as a form of the compactness in size, and the spatial containment to a certain place. Figure 4 demonstrates possible ways in which women face spatial entrapment regarding accessibility experiences. Women may be spatially entrapped due to a smaller time budget and therefore have a smaller accessibility space as a result compared to men, as depicted in Figure 4 (A). Or women may be spatially entrapped due to tighter space-time fixities which limits accessibility spaces to those near home, while men have more extensive and diverse accessibility spaces, and

therefore their locational choice set is much larger, as can be seen in Figure 4 (B). Whether gendered spatiality is manifested in a certain characteristic of accessibility space or in a combined form of these two will be examined.

1) Gendered spatiality by average size of accessibility space

When average size of accessibility space by gender and parental status is examined, the results in Table 6 show that, regardless of parental status, there are no significant gender differences in the size of accessibility space. The finding is consistent across a variety of accessibility measures. In contrast to general expectations again, such an insignificant difference by gender in the spatial extent of possible activity space would indicate that individual accessibility spaces of women are not necessarily smaller than those of men. Therefore, the examination of gender differences in average size of accessibility space in this section does not support existing arguments on women's limited spatiality. Further it implies that women's lower

Table 6. Gender differences in average size of accessibility space

Space-Time Accessibility Indicators	Average Size of Accessibility Spaces		Significance in Difference		
			by Gender		by Parental Status
	Husbands	Wives	<i>p</i>	<i>p</i> (Husbands)	<i>p</i> (Wives)
NUM	12230.3	12225.1	0.993	0.731	0.118
NUMT	10582.2	10471.7	0.831	0.521	0.379
AREA	14729.7	14309.5	0.577	0.631	0.073
AREAT	12092.5	11606.7	0.462	0.469	0.333
WAREA	15510.7	15114.8	0.611	0.676	0.079
WAREAT	12835.9	12375.2	0.503	0.504	0.341
<i>Households without Children</i>					
NUM	12108.7	12763.1	0.378		
NUMT	10372.0	10751.3	0.583		
AREA	14502.0	15138.9	0.531		
AREAT	11789.3	11997.8	0.814		
WAREA	15305.4	15956.1	0.535		
WAREAT	12544.2	12775.8	0.802		
<i>Households with Children</i>					
NUM	12391.5	11556.1	0.326		
NUMT	10860.8	10124.0	0.346		
AREA	15031.5	13278.4	0.117		
AREAT	12494.4	11120.5	0.166		
WAREA	15782.7	14068.8	0.140		
WAREAT	13222.7	11877.3	0.193		

Note: The suffix T represents measures incorporating the effect of the temporal availability of opportunity (i.e. reachable and non-reachable).

Num: the total number of urban opportunities within the PPA

NumT: the total number of urban opportunities that are reachable within their opening hours

Area: the sum of area of urban opportunities within PPAs

AreaT: the sum of area of urban opportunities that are reachable within their opening hours

Warea: the sum of weighted area of urban opportunities by their building height

WAreaT: the sum of weighted area of opportunities that are reachable within their opening hours

space-time accessibility during a day, due to heavier household responsibilities than men, does not necessarily take a form of smaller size of accessibility space on average.

2) Gendered spatiality by average distance from home to PPAs

Whereas gendered spatiality is not established with respect to the average size of accessibility spaces, the results in Table 7, however, point out

the existence of gendered spatiality, which takes a form of more locationally constrained characteristics of women, compared to men. Specifically, women's accessibility spaces are more likely than men is to be close to home, as shown in terms of the average distance from home to origin locations of PPAs (space-time prisms). Gender differences are found statistically significant between couples with children, but not between couples without children. Furthermore, women's daily accessibility space

Table 7. Average distance from home to PPAs by gender and parental status

GENDER	Average distance from home to PPAs (in minutes)	Significance in Difference (<i>p</i>)	
		by Gender	by Parental Status
Men	14.8	0.002	
Women	12.1	0.002	
Husbands without Children	14.7	0.465	0.927
Wives without Children	13.9**	0.465	0.000
Husbands with Children	14.9	0.000	0.927
Wives with Children	10.1**	0.000	0.000

Bold: Mean difference by gender is statistically significant at the 0.01 level (2-tailed).

** : Mean difference by parental status is statistically significant at the 0.01 level (2-tailed).

becomes further spatially limited to home by having children, while the change in parental status does not significantly affect the spatial extent of men's daily accessibility space in location.

Although women tend to be confined within more limited spatial boundaries compared to men, the more home-centeredness of women's accessibility spaces is not because of smaller accessibility spaces on average due to a smaller time budget than men is. It is rather because of the location-confined nature of accessibility spaces due to space-time rigidity which makes women need to be at home and travel to child-caring activity locations which are usually nearby.

5. Understanding Spatio-temporal Context of Accessibility Space

It is crucial to examine situations where space-time prisms are made, in order to understand home-centeredness of daily accessibility spaces of women. Such an effort will be accompanied with the attempt to examine how household responsibilities and fixed activity distributions in space and time are associated with characteristics of

accessibility spaces in space and time. It is expected to provide some useful insights to interpret revealed activity patterns in a more appropriate manner by linking accessibility space to activity space.

1) Temporal pattern of fixed activities by gender

In the previous section, we found that women have a greater level of fixity constraints as they shoulder heavier household responsibilities than men in addition to paid work. Figure 5 demonstrates how fixed activities are temporally distributed throughout a day, clearly showing that women's heavier fixity is mainly due to household work in addition to paid work, and that gender differences become more distinct when dual-earner couples have children.

Women with children encounter more household work than men with children, and furthermore their household work burden takes place not only in the morning and in the evening like men, but also during the daytime. In particular, in the late afternoon or in the early evening, women with children are found to carry out a great number of household-related obligatory activities.

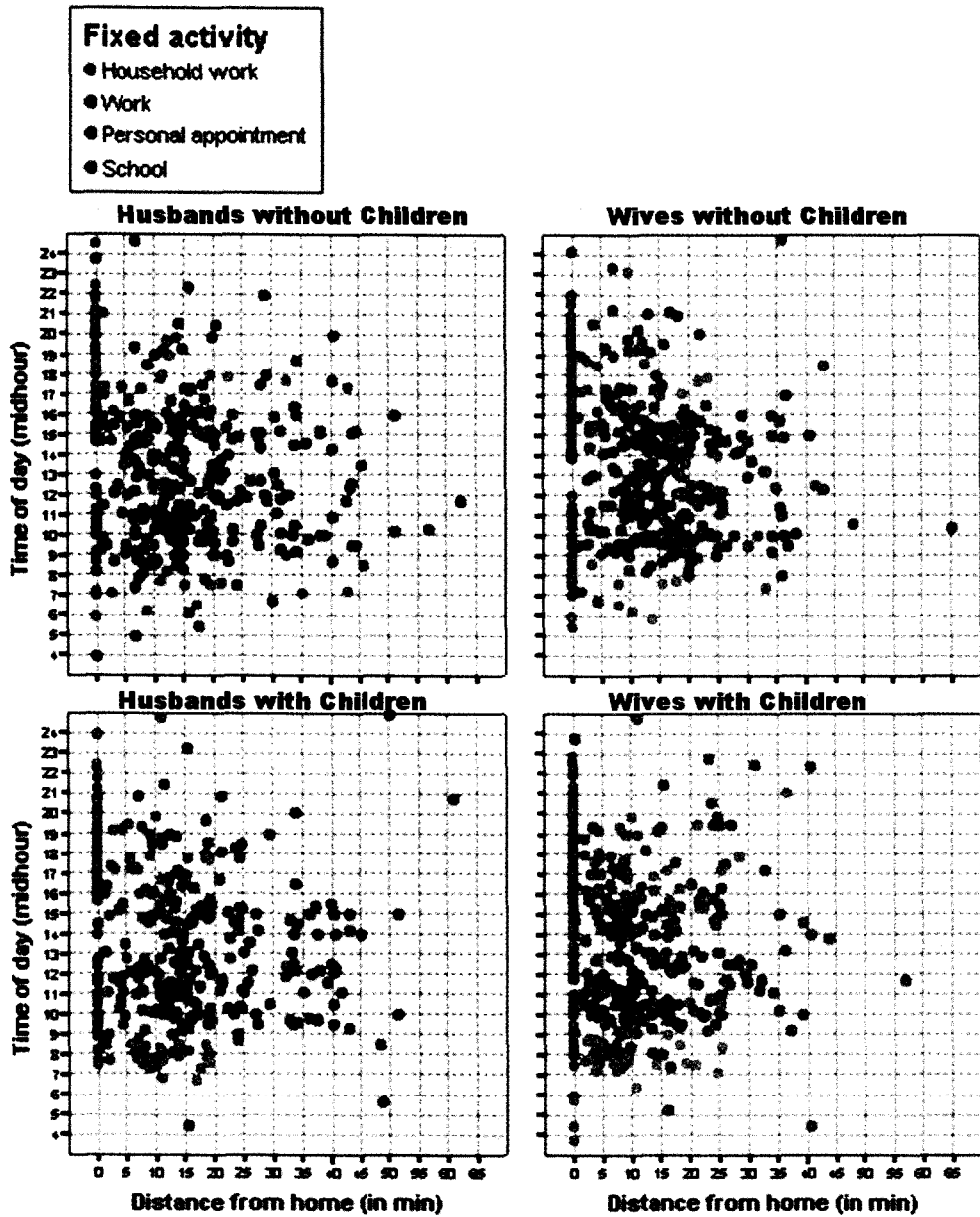


Figure 5. Spatio-temporal pattern of fixed activities by gender by activity purpose: the occurrences of fixed activities in space and time, unweighted

2) Spatio-temporal patterns of fixed activities by gender

Since our point of interest is on gendered spatiality, it is worthwhile to note how household

and other types of fixed activities are located in space as well as in time. Figures 5 and Figure 6 show spatio-temporal patterns of fixed activities by gender and by activity purpose. Figure 6 demonstrates that, whereas couples with no

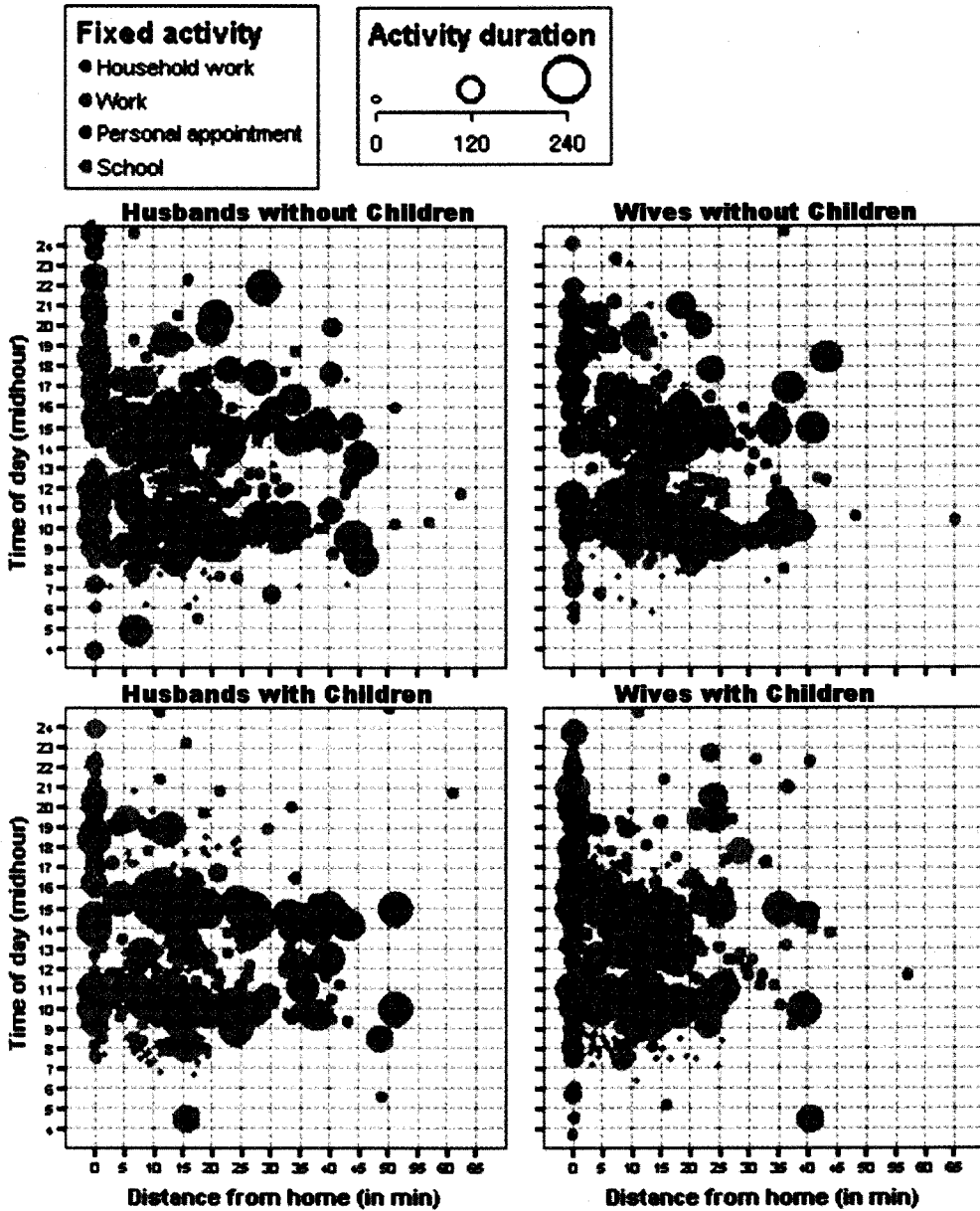


Figure 6. Spatio-temporal pattern of fixed activities by gender by activity purpose: the occurrences of fixed activities in space and time, weighted by activity duration

children do not have significant gender differences in fixed activity patterns in space and time, couples with children show gender difference in spatio-temporal patterns of fixed activities. Working mothers have not only more

in-home activities throughout a day, but also a lot more out-of-home household-work activities than men. Such out-of-home household-serving activity locations are mainly within 5~10 travel time distances from home and are located much

closer to home than workplaces locations overall. In addition, workplaces for wives with children are much closer than those for husbands with children, while no dramatic difference is found for couples with no children, as pointed out in the previous section on activity space. On the other hand, other types of fixed activities (personal appointments and school) are minimal regardless of gender and parental status and also do not show distinctive gender differences in location in space and time.

When each fixed activity is weighted by activity duration as shown in Figure 6, the relatively small size of circles, which represents out-of-home household work activities, implies that these activities include mainly picking up and dropping off children, which is spatially and temporally fixed with a great level of rigidity.

3) Spatio-temporal pattern of accessibility experience by gender

With detailed understanding of underlying space-time constraints, which shapes accessibility experiences, gendered spatiality manifested by women's more home-centeredness in daily accessibility space becomes more interpretable.

Figure 7 shows the gender differences in the occurrences of accessibility spaces in space and time. It provides a clear difference by gender and parental status. In couples without children, husbands and wives do not show any noticeable differences in patterns. Two major types of accessibility space formation are the midday lunch break and the evening after-work time periods. In the case of couples with children, husbands have similar patterns to couples without children, in that the relative importance of work-to-home after work and work-to-work during midday is quite visible. On the contrary, such importance is dramatically reduced, and even becomes very minimal in the case of

women with children. Working mothers show significantly distinctive patterns of accessibility space in space and time, contrasted to those without children or men with children. During the midday, the relative importance of other places increases (more dramatically in the evening), and work-to-home accessibility becomes far less important for working mothers. Instead, home-centered accessibility spaces and the other-to-home accessibility spaces become predominant types, which render women more sensitive than men to urban opportunities close to home. Given the high proportion of out-of-home household work among non-work out-of-home fixed activities (that is, other activities) as identified in the previous section, the other-to-home accessibility space is basically equivalent to the child-serving location to home accessibility space. The higher level of space-time rigidity for the evening household activities renders women inaccessible to urban opportunities near workplaces and along the journey from work to home. It only allows women to have access to urban opportunities after they arrive at daycare centers or at home to accomplish household-serving and child-serving activities. This prevents women's accessibility spaces to extend farther away. Whether the workplace is farther away from or closer to home, it does not critically influence women's spatial experience of accessibility spaces, since their major type of accessibility space is the household-serving location to home, not workplace-to-home.

The findings so far suggest that women's spatial entrapment or tendency to be home-attached should be understood within broader and more complex but interlinked contexts of their activity, mobility, and accessibility. Like men, most travels by women are not home-based. Even travel distances or times by women are not necessarily shorter than men is. The reason women have activities relatively more at, and much closer to,

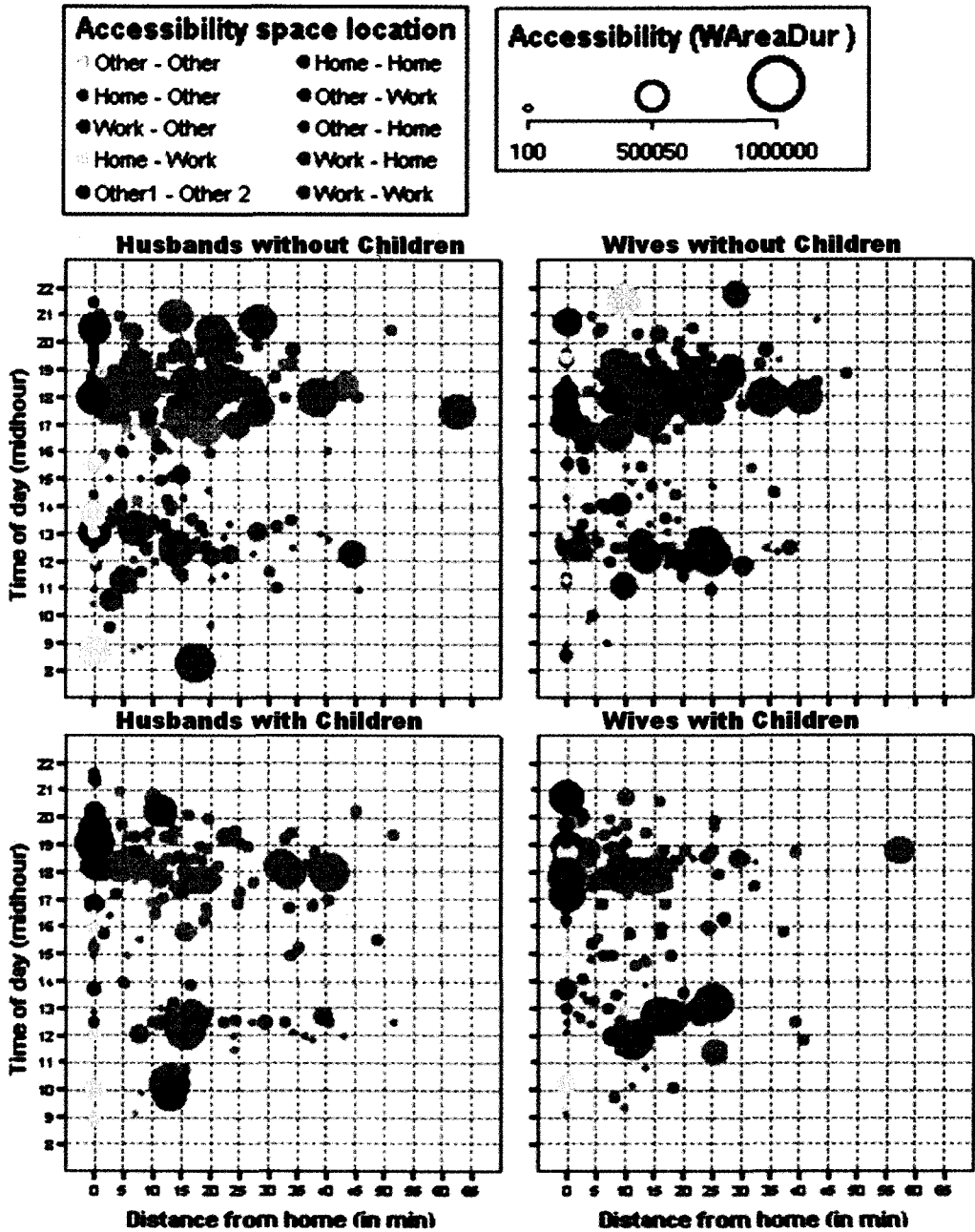


Figure 7. Spatio-temporal pattern of accessibility experiences by gender by location context: the occurrences of accessibility in space and time, weighted by the level of accessibility (WareaDur)

home is the very women's gender-role constraints and their associated accessibility experience, which is home-centered or home-oriented

accessibility spaces.

6. Understanding Activity Space through Understanding of Accessibility Space

The examination of accessibility space in space and time reveals that while men have more space-time autonomy to participate in discretionary activities after work, women do not. In other words, husbands can reach urban opportunities not only close to home but also far away and close to the workplace. However, wives with children are not very accessible to urban opportunities located far from home. The more household-work activities in and out-of-home and more importantly associated timing constraints (e.g. the pick-up children from daycare center) limit women's possible activity space to just near home, because women become free only after picking up children at the daycare center which is likely to be much closer to home than workplaces, or even after coming back home and finishing household-serving activities at home after work.

The presence of a considerable amount of out-of-home household-serving and child-serving activities and travels, especially in the evening (or after work), for working mothers, results in the decrease of the relative importance of work-to-home accessibility spaces, as indicated in the previous section.

The findings on activity/travel contexts where accessibility spaces (PPAs) are made during a day indicate that, for husbands, the workplace is a relatively more important focal point for urban opportunities, since accessibility spaces are mainly constructed in between the work-to-home fixed activity pairs and the work-to-work fixed activity pairs. By contrast, working mothers have home as a relatively more important focal point compared to the workplace. Their accessibility space is made mainly in the home-to-home fixed

activity context, while the relative importance of work-to-home accessibility space is a lot lower, compared to men or women without children.

The home-centeredness of possible activity spaces, however, should be distinguished from revealed patterns of home-centeredness of activities/travels. Being accessible to opportunities only around the home needs to be distinguished from actual participation in activities near home. Distance does not inherently imply anything. People might want to choose opportunities close to home for a variety of reasons, even though they can access opportunities at very remote places. Therefore, the shorter or longer distance cannot be a direct and inherently meaningful indicator. In considering the factor of distance, we can just describe individuals' spatiality in some sense, but cannot fully explain or understand it. What matters is the situation. The activity space or travel distance should be understood in terms of whether people either choose or are constrained to be at/near home. For some, being at home is a choice since home could be a place of comfort and relaxation, and going to nearby locations even with a large enough time budgets may be rational, since longer activity times can be enjoyed.

Figure 8 illustrates the possible relationships between accessibility spaces and activity spaces. Small activity space can be derived either because of the small accessibility space (Figure 8(A)), or because of the choice of activity locations within a shorter travel distance even when a large accessibility space is allowed (Figure 8(C)). Therefore, we should keep in mind that the same outcomes can be generated by different situations. Such classification helps our understanding of why women and men have similar spatial extent of activity spaces despite their gap in accessibility space experiences. In the case of men, their alternative activity space could

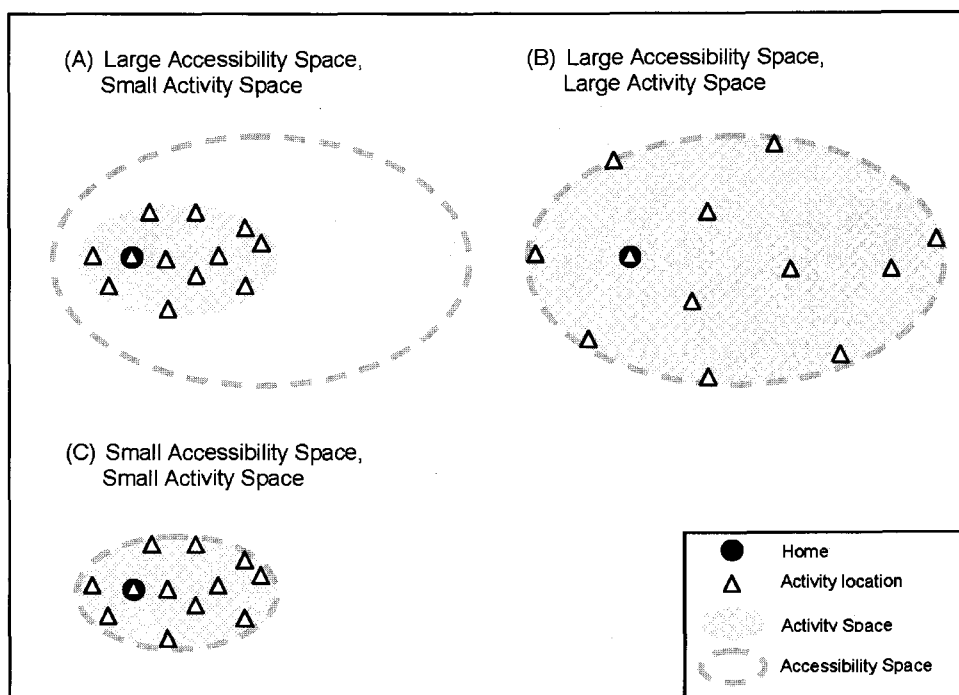


Figure 8. Possible relationship between accessibility space and activity space

have taken the type (B) – large activity space due to large accessibility space, which in turn would clearly render gendered spatiality, but it was not revealed in reality. On the contrary, in the case of women, they have no choice but to have a small activity space because their possible activity space itself is very limited. Linking accessibility space to activity space provides not only appropriate interpretation of the nature of revealed activity/travel patterns, but also the detection of its gendered spatiality which would be invisible otherwise.

7. Conclusions

The examination of the relationship between gender, household responsibility and gendered spatiality leads to several conclusions. First, the results agree with general expectations regarding

the relationship between gender, household responsibility, and accessibility. The presence of children results in the increase of women's household work responsibility in terms of average and total work hours during a day and the number of activities undertaken, which in turn leads to women's lower daily accessibility to urban opportunities.

When the focus is moved to gendered spatiality, the results, however, do not follow general expectations. One would expect that women would have shorter and/or closer to home travel behaviors or less out-of-home activities and more in-home activities due to a heavier household work burden than men. However, the way the household responsibility is linked to gendered spatiality is not as straightforward as previous researches has often assumed. Despite women's more household responsibilities, their activity spaces are not necessarily smaller than those of men. Average travel distances from one location

to another are not different between husbands and wives whether they have children or not. Furthermore, the average activity space from home to either fixed or flexible activities does not show any gender difference. However, the average travel distances from home to workplaces show gender difference – women’s workplaces are located closer to home than men’s. Given the findings in this study, it is hard to tell that women have smaller, or more home-centered, activity spaces than men.

Furthermore, when gendered spatiality is examined in terms of the percent of in-home and out-of-home activities, the results again point out that conventional assumptions on gendered spatiality (and therefore indicators based on them) need to be reexamined. The dichotomic assumption that home is mainly the location for obligatory activities, since women are usually attached to home for household work, and out-of-home is mainly the location for discretionary activities, is problematic. Usually more out-of-home activities are believed to be an indicator of better access to urban opportunities. However, results show that the ratio of out-of-home and in-home activities is not different by gender and, even more, women have more out-of-home activities (either discretionary or obligatory) than men. Interestingly, the results also show that most of in-home activities are in fact discretionary, while most of out-of-home activities are obligatory. What should be noted here is that temporal autonomy may not be directly captured in the form of the number of out-of-home activities. It should not be ignored that more than 80% of flexible activities are undertaken in home instead of out-of-home for men, and more than 60% of fixed activities are undertaken out of home instead of in-home for women. Therefore, the implication of the findings is that the rigid dualistic assumptions on location need to be reconsidered. Home is not only a place of

constraint for obligatory household work but also a place of choice for relaxation and amusement. On the other hand, out-of-home is not necessarily a place of choice but also a place of constraint. Even though it is true that women with heavier household responsibilities have more in-home obligatory activities, it does not directly result in women’s smaller out-of-home activities. Rather, women have more out-of-home obligatory activities as well as more out-of-home discretionary activities.

Therefore, measures on gendered spatiality in terms of the frequency of out-of-home or in terms of the distance of activities from home do not strongly support previous findings on women’s more home-attached situation and more home-centeredness. Actual activity space does not vary by gender. The result implies that household responsibility does not necessarily structure gendered spatiality of activity space. Revealed patterns of short travel distances would actually be the outcome of either constraints individuals face, or their choices. Likewise, staying at home can be either a result of one’s spatial fixity or a result of one’s choice. The primary question of gendered spatiality is who has more autonomy reaching and being at a certain place.

In this regard, gendered spatiality is examined in terms of possible activity space given to individuals, that is, *accessibility space*. When the average size of accessibility space is compared between men and women, the results find no significant difference. The spatial extent of women’s possible activity space is not smaller than men’s.

Rather, the results suggest that gendered spatiality can be captured by *where and when accessibility spaces are made*, instead of by size, by gender. Accessibility spaces for women with children are found to be more home-centered than other groups of people. The results indicate that working mothers are spatially restricted to

areas closer to home in terms of possible activity spaces. In the case of husbands, the most salient type of accessibility spaces occurs in the workplace-to-home travel context, which is made after work in the evening, and the next is the accessibility space in the context of the excursion from/to the workplace, during the lunch break. That is, their possible activity space is extended to places around workplaces, which is even significantly farther away from home compared to women's. In other words, husbands have spatial autonomy to choose their activity locations in between home and work. On the other hand, wives with children are more likely than husbands to have another space-time constraint after work. Unlike their husbands, wives with children cannot enjoy their space-time autonomy right after work (in time) and on the way home from work (in space). Working mothers must take trips to serve the household after work, such as picking up children and must also perform household maintaining activities at home. So, their accessibility space is only made on the way home from another location, which is much closer to the workplace, or after coming back home. In this way, women's possible activity space becomes more home-centered compared to men's.

In conclusion, the analysis of the spatio-temporal context of accessibility space makes gendered spatiality visible. More household responsibilities throughout a day and, even more, the time constraint of picking up children at the daycare centers after work leads women's possible activity space to be more home-centered. However, such gendered spatiality associated with household responsibility is not easily discernible, when actual activity space based on revealed activity/travel patterns is simply analyzed. It is because the revealed activity spaces can be not only an outcome of constraint but also an outcome of choice. No

significant gender difference in the spatial extent of fixed and flexible activity spaces from home or in the number of out-of-home discretionary activities suggests that conventional methods on gendered spatiality call for critical examination of the activity/location assumptions they are based on, and more careful interpretation of the results.

Women's activities are more likely than men is to take place near home and day-care centers, and/or in between them, whereas men have more freedom to make trips further away from home and participate in activities in broader areas. However, when actual travel distances and location choice was examined, no significant difference was found between men and women. It is because men, despite their large space-time autonomy, decide to stay at home for their discretionary activities and choose activities near home instead of in remote areas. In contrast, women have no choice but to travel a short distance within limited areas around home, due to the very nature of the spatial-temporal fixity they face. That is, even if women and men are differently situated, outcomes are not statistically significant. Women's activity space is limited by spatial-temporal constraints. However, in the case of men, their activity space is determined by their preference of home as a discretionary activity location, and/or short travels to nearby out-of-home activity locations, as well as by the land use characteristics of accessibility spaces.

Therefore, the findings in this study suggest that behavioral outcomes should be understood with an explicit awareness of constraints individuals face. In addition, behavioral outcomes should not be treated as a straightforward expression of the level of constraints. It is problematic to expect that behavioral outcomes directly mirror the level of constraints. It is also problematic to suppose that the level of constraints can be straightforwardly elicited from revealed behavioral outcomes.

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