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**EMPLOYMENT AND THE NATURE OF
WORK: THE IMPACT ON MOBILITY
AND ROAD TRANSPORT NEEDS**

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TITLE: Employment and the Nature of Work: The Impact on Mobility and Road Transport Needs

ABSTRACT:

The objective of this paper is to establish an appreciation of the changing nature of labour force participation and work practices as they impact on mobility and road transport needs. As more workers have shorter and longer hours than the typical 38 hour week, and as job opportunities increasingly move to the suburbs, the development of a road infrastructure strategy must take the changing spatial and temporal nature of work activity into account.

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1. Introduction

The spatial and temporal nature of work activity has a very important linkage to the spatial and temporal profile of travel, and hence to the performance of the transport infrastructure, especially the urban road system. The changes in the size and composition of the labour force over the last 20 years send a very important message about the changing set of opportunities for residential and workplace locations as well as the timing and frequency of commuting activity. The key characteristics of the adjusting workforce and work schedules are increased flexibility in working hours (both in magnitude and temporal commitment), the greater ability to vary the number of weekly or bi-weekly working days, the redistribution of work opportunities, and the changing take-up rate between the genders (increasing the incidence of multi-worker households).

While the total amount of work travel has not varied greatly for some time, and so the effects of work changes are essentially redistributive, personal business and shopping trips have been rising in many countries: Australia and the US included. These shifts are associated with work travel, part time work, and higher female participation rates, but the effect is to multiply the impact of changes in work patterns. There has been a steady increase in the level of personal business and shopping travel rates per person, while working travel rates have stayed comparatively stable. The effects are probably related. The changes in working patterns, times and participation rates are clearly linked. Changes in working patterns appear to be related to increases in nonwork travel, and there is parallel evidence that such a rise in trip rates is occurring.

The net effect of this process of adjustment in labour market practices is peak spreading, suburbanisation of traffic, increased car ownership (linked to both greater financial resources in the household and the need for increased mobility), multi-purpose chained trips (e.g. journey to school/child care en route to work), suburbanisation of residential locations, decentralisation of workplaces to capture the new composition of the labour force, and increasing non-commuting travel during the spreading peak and non-peak times.

The objective of this discussion paper is to establish an appreciation of the changing nature of labour force participation and work practices as they impact on mobility and road transport needs. This will provide a current reference point from which to anticipate profiles of travel behaviour over the next 20 years, to assist the Roads and Traffic Authority of NSW in the development of its corporate strategy.

2. The Labour Force in Recent Times

The labour force participation rate is changing (Table 1). The composition of the workforce is changing. The opportunities for an increasing diversity of work schedules are becoming more widespread leading to an increase in the demand for participation in the workforce by the population of individuals of eligible working age. The lifelong commitment to a single employer and a limited set of ages for exiting the workforce are changing. An increasing number of workers are self employed and on contracts with more than one organisation - the traditional journey to work is replaced by travel to multiple destinations and often as part of work and is fully tax deductible. What dimensions of the observed evolutionary process of change signal significant changes in the spatial and temporal patterns of travel behaviour? In this section we extract the key 'indicators'.

Table 1. Australian Labour Force Participation and Work Schedules

(i) Index of work availability (aggregate weekly hours worked per person in gender class aged 15-64 years). Source: ABS Cat.6203

Year	Hours per Male	Hours per Female	Hours per Person
1975	36.8	15.1	26.1
1980	33.2	14.5	24.0
1985	30.3	14.1	22.2
1990	31.5	16.4	24.0
1993	30.1	16.3	23.2

(ii) Workforce participation rates by age for males and females (percent). Source: ABS Cat.6203

Age	Male			Female		
	1975	1990	1993	1975	1990	1993
15-19	59	61	54	56	59	54
20-24	91	90	88	65	79	76
25-34	97	95	93	47	67	65
35-44	97	95	93	52	73	72
45-54	94	90	89	45	61	65
55-59	88	75	74	30	33	37
60-64	71	51	48	16	16	13
65+	17	9	9	4	2	2
Total	81	76	74	42	53	52

(iii) Hours worked by employed persons ('000). Source: ABS Cat 6203. *: In 1975, the age ranges 1-15 and 16-29 were combined. Likewise for ranges 41-44 and 45-48. See Appendix for Graphs.

Weekly hours worked	Male			Female married			Female not married			Female total		
	1975	1982	1993	1975	1982	1993	1975	1982	1993	1975	1982	1993
0	182	213	179	69	79	93	31	50	52	99	128	145
1-15	208*	130	259	444*	288	398	123*	128	253	567*	416	651
16-29		225	280		289	436		98	154		386	590
30-34	138	299	287	123	121	197	38	83	113	160	204	310
35-39	423	617	729	188	196	323	163	195	255	351	390	578
40	1563	1177	908	363	255	243	290	289	220	653	543	463
41-44	497*	252	261	57*	38	65	53*	50	56	110*	88	121
45-48		359	420		35	79		35	63		70	142
49 and over	758	753	1151	62	82	183	28	46	87	90	128	270

Total	3769	4024	4474	1305	1381	2016	725	974	1253	2030	2355	3270
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(iv) Average weekly hours worked by employment category, 1975-1992. Source: ABS Cat 6203.

August	Average weekly hours worked					
	Full-time workers		Part-time workers		Total	
	Males	Females	Males	Females	Males	Females
1975	42.2	38.2	15.9	16.3	41.2	31.0
1985	41.3	37.7	16.2	15.8	39.8	29.5
1992	43.0	39.2	14.9	15.6	40.0	29.0

A common theme of the labour literature in the 1980's was a long term trend to a future decline of the availability of paid work. The downward trend was assumed to be due to persistent long-term unemployment attributed in part to economic recession and structural rigidity, but also to the impact of technological developments creating reductions in the demand for labour and capital inputs in many organisations. What was missing in much of the debate was an appreciation of the role of changing work practices (with evolving union support) which gave greater opportunities for increased availability of paid work but under a wider set of work schedules. This increased flexibility in the number of hours, the number of days and their temporal occurrence offered working opportunities to a larger number of eligible workers. Given their reservation wage and time budget, this increased their willingness and ability to participate in the labour force.

We are beginning to see a long term trend to shorter standard weekly, annual and lifelong working times (Dawkins and Barker 1987) with a mix of polarised and redistributed reductions in working time. The reduction in working time is not a uniform trend. Polarisation involves continuation of long work hours for some and no work hours for others; redistribution involves shorter working hours which are widespread on a sufficient scale to counteract job loss, leading to a society enriched by the spread of 'liberated time' (Tracy and Lever-Tracy 1991). This increasing heterogeneity away from a classical work schedule has produced a significant change in the composition of the workforce with respect to age, gender and education. The most dramatic change is in the increase in the number of females entering the workforce under different work schedules (number of hours, number of days per week). A consequence of this development is the increase in the number of multi-worker households producing residential location choice behaviour which may be very different from that of traditional single-worker families. With multiple workers and diversified spatial workplaces the residential location choice set is expanded.

The data in Table 1 show the predominance of redistribution for females over the last 18 years with some increase in the total availability of paid work. The female work availability index (Table 1(i)) decreased marginally up to 1985 and then increased substantially. Despite rising unemployment there are fewer females with no paid work in 1993 than there were 18 years ago. For males, however, polarising trends have predominated in the context of some overall

decline. Early retirement and persons under 20 years old staying at school or enrolled full time in a tertiary institution through choice or enticement have been major forces at work producing participation rates which decline from 81% in 1975 to 65% in 1993 (Table 1(ii)). The most noticeable declines occur in the 15-19 and 55-64 age groups. Some of the decline, especially early retirement, is structural, and is in part linked to opportunities for organisations to employ people under less expensive work arrangements (part-time, contracts etc.). However reductions in the standard week is often counteracted by some increase in overtime and by greater rises in unpaid hours. Many employers prefer the higher cost of overtime for known staff rather than employ part-time staff, but this is changing slowly as the pool of part-time staff to choose from increases.

3. What is the Future Likely to Look Like and What does it mean for Travel Behaviour and Road Transport Needs?

Attitudes and opportunities to career, to higher education, and to having children have changed. We have increased participation of women in the workforce; initially on a part time basis and increasingly on a mix of part-time and full-time work as child care facilities improve, as the number of children in households diminish and as career becomes increasingly important. In 1987, 64% of households in Australia had no children under the age of 15 years. Average household size has declined steadily over the century from 4.53 persons in 1911 to 2.85 persons in 1987. By 2011 the average household size will have fallen to 2.64 persons (Ironmonger 1994). The average number of workers per household is increasing. This is partly out of economic necessity and partly out of choice. It can be attributed to higher rates of divorce, the growing number of non-nuclear family units, improved education creating a new career attitude, and changed attitudes of employers to the commitment and contribution of women and part-time employment for both genders. The gender differences in work schedules have been converging fast in the last 10 years and are likely to be eliminated in the next 20 years.

No longer is it necessary in all work activities to be physically located at the main employment location. More flexible work schedules are linked to more scope for extending the actual hours that a business is “open” and for worker preferences in defining the hours per day, the days per week and the location of work activity. Telecommuting, compressed work weeks and highly variable working periods are options to a growing number of job contexts.

A number of scenarios are likely to emerge for patterns of travel:

1. Shorter trip times are spreading across both genders for an increasingly higher proportion of commuters. The growing incidence of part time work, primarily by females has compensated the increasing traffic congestion to keep average work travel times relatively constant over the last 20 years. The 1971 Sydney Area Transport Study reports an average commuting time of close to 25 minutes, similar to the mean of 25 minutes from the 1981 Sydney Region Travel Survey. An exposure survey undertaken on behalf of the Federal Office of Road Safety shows that the average trip length in 1986 of a male worker in Sydney was 28.7 minutes when full-time employed and 25.2 minutes when part-time employed; for female workers the respective averages are 25.5 and 23.9 minutes. The average travel time in 1986 was 27 minutes, supporting the stability of mean commuting trip times over time.

2. Working hours are spreading, with a growing proportion of shorter working hours and a growing incidence of longer working hours (normal plus overtime). This is spreading across the genders. The reduction in travel time associated with shorter working hours contributes to reducing traffic congestion (at least in one of the peak periods); the extended working hours have the same effect, notably in the evening peak period. The increased time available for non-commuting by part-time workers will contribute to an increase in off-peak vehicle use and hence help to flatten the peak. That is, we are likely to see a flatter profile of vehicle kilometres by time of day throughout the day. This is a desirable outcome for road investment, contributing to making better use of the infrastructure, subject to optimal capacity being in place. The program of future investment in roads will need to take this into account. One of the major ways people respond to congestion is to decentralise their jobs and residence. The paradoxical finding is that even while congestion on specific facilities has become worse, the average speed encountered by commuters has not.

3. At the same time that work practices are loosening up, more and more jobs are being suburbanised in part due to firms (ie. jobs) following people. The shorter work trips will also spread over an even longer but flatter 'peak'. The combination of increased flexibility in work schedules, job suburbanisation and peak spreading will work against the future of public transport, especially rail public transport which requires a relatively dense corridor of movement activity to be economically and environmentally sustainable. Radially biased high density public transport corridors are losing their growth opportunities, even though preserving in many instances their patronage. The automobile will continue to preserve its dominating role.

In seeking an explanation for why females currently have shorter commutes than males, Kim (1994) reviews the published evidence and undertakes a comprehensive investigation for Los Angeles. Popular opinion that children in a household have an influence on limiting commuting distances of females is unambiguously supported by the evidence. It is a controversial and

important issue as household size declines over time. Kim shows that females in two-worker households commute shorter distances than single-worker female households, suggesting that household type may be an important influence on commuting distance, in addition to gender. The evidence also suggests a possibility that female workers place a higher value on avoiding the burden of commuting for many reasons including the greater share of day-to-day domestic functions still carried out by the female in the household. What is becoming clear in the literature is that the current gap between commuting behaviour of males and females is closing faster for single-worker households than multi-worker households. With an increase in single-parent households with a single worker, we can expect the preparedness of females to commute slightly longer distances than dual-parent households with multi-workers. For financial reasons there is a greater preparedness for single parent households to accept jobs further away from home.

Increased Flexibility of Work Schedules

Recent international research seeking to identify ways of improving air quality, stabilising enhanced greenhouse gas emissions and reducing peak traffic congestion in urban areas has focussed on the potential contribution of more flexible work practices, in a spatial and temporal sense. Changing work practices may be the most successful strategy to secure significant transport-related environmental benefits. For example, if all employees worked at home 1 day per week, the benefits to air quality (but not necessarily global warming) and congestion and hence road investment needs could be as high as 20% on current levels.

Two major changes have created a shift from working full-time in a single location to working in multiple locations. Wherever workers are, new technology has provided small, powerful, and affordable tools with telecommunications networks to link people together. Changes from industrial age management by surveillance and time clock to management by results has provided the means to cope effectively with a dispersed workforce. That resulting shift in workers away from centralised work sites to remote locations, including homes, is being accelerated in the USA, for example, by federal policy mandates. One of those mandates is the reduction of commute trips to meet federal air quality standards. Telecommuting and compressed work weeks are two strategies worthy of further implementation:

Telecommuting

Telecommuting, together with compressed work weeks, and flexible working hours is an evolving employment option (Pratt 1994, Yen et al. 1994). Telecommuting involves working

from a remote office site which is typically the employee's home, although in the future satellite 'telework' centres near or in residential areas, fully equipped with appropriate telecommunications equipment and services, can serve employees of single or multiple firms, co-located on the basis of geography rather than business function (US DOT 1993). Even the automobile will start playing a greater role as an office. In 1993 there are over 1 million mobile phones in Australia and 1 in 5 households have a fax machine.

In the USA 7.6 million people are estimated to telecommute, typically spending 1 or 2 days per week working from home (Urban Transportation Monitor, July 9, 1993). They rely increasingly on computers and advanced telephone services to communicate with their regular office. One-third of the telecommuters are contract employees. The opportunity to telecommute will be determined by both the desire of the potential telecommuter, the policy of their employer and especially the attitude of immediate bosses. Telecommuting is currently an experiential issue - it is not known well enough for enough individuals to make a well-informed judgement about its prospects (Mannering 1993). It raises important questions about *jobs-family balance* and the social and personal benefits of degrees of spatial separation. Estimates of savings in vehicle kilometres of urban travel range from 5% (Downs 1992) to 15%. In unpublished work Golob (University of California at Irvine, 1994) suggests that telecommuting in California may reduce vehicle kilometres by as much as 10%. Achievement of these take up rates is possible in the next 20 years.

The range is a product of the uncertainty over the substitution between commuting and non-commuting travel activity and the kilometres incurred if the tele-work site is not a home. We anticipate that telecommuting 1 day a week will increase the productivity of telecommuters and lead to a long term reduction in *commuting* kilometres of up to 10%. However it is likely that some of this reduction will be converted to non-commuting kilometres, with increasing percentages occurring in the peak period, partly negating the gains. The further possibility of suburbanisation of residential location may add commuter kilometres (Nilles 1991). The best estimate of the net effect of telecommuting over the next 20 years is a 5% reduction in total vehicle kilometres, provided the opportunity to telecommute is opened up to a significant number of workers.

Compressed Work Weeks

Modified working hours in the form of compressed work weeks is a much more promising means of reducing commuting kilometres. Ewing (1993) claims that peak-hour vehicle trips to work sites can be reduced by between 20%-50%, an extremely unlikely outcome. A concern with compressed work weeks is that any saving in commuting kilometres is a gain for the

peak, but they are replaced with non-commuting kilometres which may be greater. The benefit however is in a flattening of the peak but at the cost of a spreading of the peak as increasingly more non-commuting kilometres occur in the peak period. These increasing non-commuting kilometres may, if trip data were more meaningfully defined as trip chains, reflect the growing incidence of multi-purpose trips of which commuting is a component. The increase in trip chaining also means that the use of public transport is limited.

Jobs-Housing Balance and Land Use

A particularly important feature of the debate on the role of the daily commute is the jobs-housing balance (Wachs et al. 1993). It has often been claimed that if we can balance jobs and housing spatially that commuting times can be reduced and automobile kilometres reduced. Jobs-housing balance vehicle kilometre targets have been suggested as a way of reducing traffic congestion of transport modes. The success of directed action (on growth management) seems unlikely; rather spontaneous location adjustments due to firms decentralising to gain access to growing suburban labour pools (i.e. *jobs follow people*) is consistent with observed trends.

Other considerations affecting location choice and ipso facto commuting times such as high job turnover, high residential relocation costs, and employment heterogeneity in multi-worker households have been suggested as reasons why households seek accessibility to an array of possible future jobs rather than just to their current employment. This explains why people do not move even when their commuter trip becomes less than ‘optimal’. If this is true, when combined with the growing importance of non-work trips, residential amenity and the location of the better schools, the current debate on “excess” commuting (e.g. Small and Song 1992) requires cautious interpretation. Excess commuting is the commuting cost above the lowest possible average commuting cost consistent with the geographical distributions of work and residential sites. Given the (inadequate) current pricing regimes, even if jobs and housing appeared to be in balance, there would be substantial inter-area travel as people take advantage of low priced mobility. This is consistent with the trend to regular non-local non-peak travel, regardless of residential location.

Wachs et al. (1993) track the differences over 6 years between home and work location among employees of 30,000 employees of a large health care provider in Southern California. They found that work trip length had in general not grown over the six years, but the growth of the workforce had contributed more to the growth in local traffic congestion than had a lengthening of the work trip over time. This implies that the strategies for reducing vehicle

kilometres should reconsider the predominant interest in commuting activity and give more emphasis to non-commuting travel as vehicle kilometres increase.

4. Food for Thought: Road Transport Needs may Change

One of the most important consequences of the changing patterns of employment and work schedules, combined with the suburbanisation of workplaces, the changing size of households and the increase in multi-worker households is that the utilisation of the existing road infrastructure will become flatter over the day and by location.

It is likely that total vehicle kilometres will not decrease, but that there will be a redistribution in favour of non-commuting or multi-purpose (trip chaining) activity and shorter commuting trips for a higher proportion of the labour force. Traffic congestion will increasingly be a consequence of non-commuting (or trip chaining) activity as much as pure commuting activity.

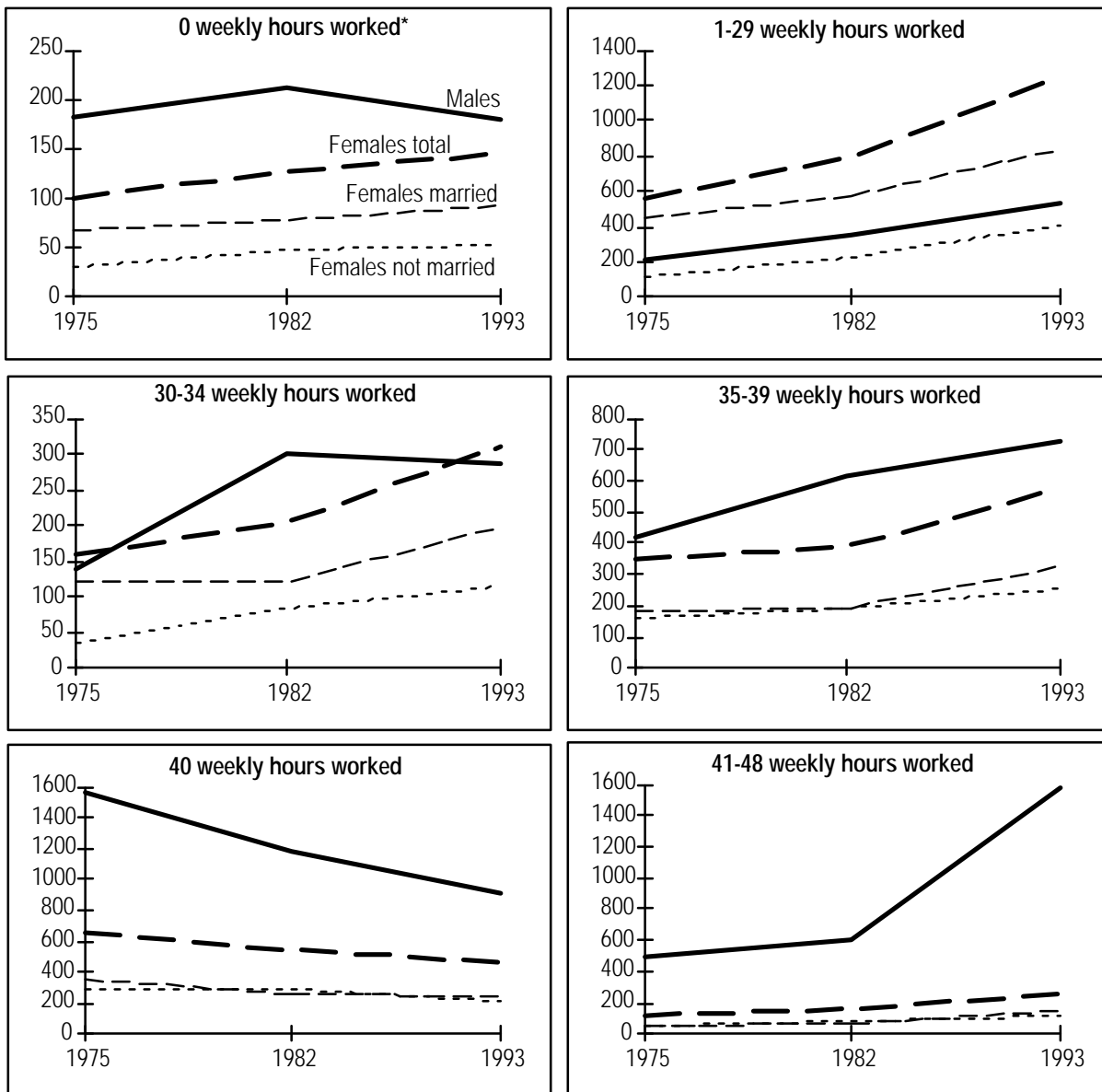
Although we have not been specific about the type of work undertaken (e.g. industrial, service provision), the trend towards the production of services will reinforce the dispersion of locations for work activity and hence the directions of change highlighted in this paper. The implications for *urban* goods movement are challenging, compensated in part by the electronic transmission of large amounts of information. The trend towards dispersed freight deliveries will continue, raising questions about the appropriate mix of vehicle types. The incidence of a higher volume of smaller freight delivery vehicles to serve the dispersed market will need to be accounted for as an additional source of traffic spread throughout the peak and non-peak periods.

The steady growth already well established in the importance of shopping and personal business travel relative to work travel will amplify these trends, and suggests that closer attention to nonwork travel will be necessary in planning for the future.

Appendix

Hours worked by employed persons ('000). Source: ABS Cat 6203.

(* 0 weekly hours worked refers to persons who had a job but were not at work)



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