Economists have argued for many years that ignoring household production introduces a bias in various areas of economic analysis. Early pioneers, Mitchell et al. (1921), Kuznets (1944) and Clark (1958) have pointed out, that national income is considerably under-estimated if household production is excluded. Kende (1975) noted that final consumption as captured by present national income accounting is misleading, when the goods and services produced by the household are excluded. Weinrobe (1974) and Bloom & Williamson (1997) argued that an increase in women’s labour participation results in the upward bias of growth rates. Walker & Gauger (1973) pointed out, that since women account for two thirds of all housework, the economic contribution of women is understated. Nordhaus & Tobin (1972) questioned the limitations and the use of GNP (gross national product) as an indicator of the national income and product accounts because of this exclusion for economic welfare. Recent studies on time-use have also shown that, on average, women engaged in household production work as long hours as women in market work (Hill, 1983; Chadeau 1992; Goldschmidt-Clermont & Pagnossin-Aligisakes, 1995) and studies from North America, Europe and Asia show that the GNP values of household production range from 5 to 61% of their GNP (Quah, 1993; Ong, 2005; Quah, 2006).

Singapore enjoyed a high growth of 6.89% annually over a 25 year period from 1975 to 2000 as GDP (gross domestic product) increased from S$25,258.8 million to S$162,62.3 million.¹ Corresponding to this growth is an increase in women’s labour force participation from 29.6% in 1975 to over 50% in 2000.² This paper seeks to account for this shift from women working in the household to the market, during the course of Singapore’s economic development, and the changes in

¹ Department of Statistics, Singapore (2005).
² Ministry of Manpower, Singapore (1975 and 2000).
the trajectory of growth, due to the inclusion of household production. There has been no study on this phenomena in Singapore to date.

The paper is organised as follows: Section I of this paper reviews the methodological and empirical literature on valuing household production and Section II presents a summary of sectoral shifts of the labour market in Singapore during its economic growth stage and their implications. Section III describes the methodology and simulations used to portray growth and structural change in extended (market plus non-market) GDP in Singapore. The model of household labour allocation used to assess the monetary value of unpaid production by women is also introduced in this section. The results and implications of the simulations are discussed in Section IV and Section V concludes.

I Measuring Non-Market Household Production

The methodological work in this field has focused on making estimation procedures commensurable with measures of market production used in the system of national accounts (Goldschmidt-Clermont, 1993a). However, problems of definition and identification of household production often add difficulties to obtaining accurate assessments of household production (See Quah, 1993, 2006).

Valuing household production

There are two main approaches to valuing non-market household production—output and input-based.

Output-based approaches

Output-based approaches value the products of non-market work by using the price of close market substitutes, often subtracting the cost of raw materials to obtain net value added. To apply the output-based approach, it is necessary to first identify the goods and services produced by the household and its market substitutes. Household production is thus the total of the market prices of the market substitutes as seen in (1)

\[ ph = \sum_i Q_i P_i \] (1)