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Labour supply responses to an increase in minimum wages:
an overview of the literature

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The contents of this paper are the responsibility of the authors and the research has been conducted without the involvement of members of the Fair Work Commission.

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- Australian Chamber of Commerce and Industry (ACCI);
- Australian Industry Group (Ai Group);
- Australian Council of Social Services (ACOSS);
- Australian Council of Trade Unions (ACTU);
- Australian Government; and
- state and territory governments.

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Abbreviations list

ABS	Australian Bureau of Statistics
AFPC	Australian Fair Pay Commission
EMTR	Effective Marginal Tax Rate
Fair Work Act	<i>Fair Work Act 2009 (Cth)</i>
FMW	Federal Minimum Wage
FWC	Fair Work Commission
HILDA	Household, Income and Labour Dynamics in Australia
MITTS	Melbourne Institute Tax and Transfer Simulator
NATSEM	National Centre for Social and Economic Modelling
Panel	Minimum Wage Panel
US	United States

Executive Summary

This paper aims to provide a review of labour supply responses to increases in minimum or otherwise low wages. In doing so, the paper finds that studies in this area of research are limited.

Research papers into labour supply responses to minimum wage increases have not been as frequent as research into the relationship between labour supply and wages, or taxes. Studies of the effects of minimum wages tend to focus on labour demand rather than labour supply. The review also found few Australian studies covering this topic, resulting in an added reliance on international literature.

Economic theory on labour supply

Labour supply can be considered a decision that involves two stages. The first, known as the extensive margin, is the decision to seek work and participate in the labour force. The second, known as the intensive margin, is the number of hours an individual decides to supply for work. The intensive margin can only be estimated for workers while the extensive margin includes estimates for non-workers.

Analysis of the elasticity of labour supply is represented by the effect of an exogenous shift in the wage (holding other factors constant) on a person's willingness to work, generating an exogenous shift in the marginal productivity of the worker. Labour supply models assume individuals assign their time between two states: work and leisure. Individuals are able to choose the amount of work and leisure to maximise their utility, subject to a budget constraint. Utility is expected to increase with income and decrease with hours of work.

An increase in wages can have two competing effects for workers—the income effect and the substitution effect. The income effect leads to an increase in the income an individual can earn from the same number of hours worked. As a result, the individual will choose to work fewer hours and increase leisure. The substitution effect raises the financial incentive of working more hours and the individual will choose to work more hours. In this instance, the opportunity cost of not working—which is measured by the wages given up to enjoy time spent as leisure i.e., the price of leisure—has increased. As a result, the overall labour supply response for the individual is ambiguous and depends on the sizes of the competing income and substitution effects. Measuring the size and direction of labour supply responses to increases in minimum wages (and other changes in variables) is performed by estimating a labour supply elasticity.

The standard neo-classical model forms the basis for the first, second and third generation models. First generation models are often described as being simple models with linear budget constraints and can only estimate the intensive margin. Second generation models use modelling techniques to correct for selection bias and can be used to estimate the extensive and intensive margins. Third generation models treat labour supply as a discrete choice, limiting the number of choices for the individual who can only choose from a set number of hours categories rather than a continuous choice of hours.

Factors affecting labour supply

The reasons for a person to seek work and the hours they would choose to work are varied. When estimating labour supply elasticities, models include some of the following factors as variables in their equations.

Wages and financial benefits of work

A primary motivation in the labour supply decision is the potential income that can be attained. Paid work provides the means to meet essential needs such as food, housing, clothing and can help to protect against low standards of living.

Reservation wages are a concept utilised in models of labour supply and labour force participation. The reservation wage is defined as the lowest wage that a person engaged in searching for a new job is willing to accept. When the market wage is below the reservation wage, a person will not participate in the labour force. Or, in the case of minimum wages, if an individual's reservation wage is above the minimum wage, then they will not seek employment. If the minimum wage is above a person's reservation wage, then this would be an incentive to seek work.

Disincentives created by the tax/transfer system

As private earnings increase, income tests applied to benefits mean these benefits are reduced or withdrawn while income tax increases. It is this interaction of the tax/transfer system with wages that can provide disincentives that may offset the financial benefits of work and therefore may affect labour supply decisions. Some Australian qualitative research has found that the loss of government benefits can act as a disincentive to finding employment or seeking additional hours.

Non-financial benefits of work

The social benefits of workforce participation may provide an incentive to supply one's labour. The workplace can provide the opportunity to expand an individual's social networks. Work can provide a source of identity, a way in which individuals perceive and define themselves.

Costs of work

There are both financial and non-financial costs of work. Non-financial costs include the opportunity cost of not being able to choose more time for leisure or home production. A major financial cost associated with engagement in work for parents is childcare. Beyond childcare, there is little Australian research focusing on the costs of work such as uniforms, equipment and transport, particularly the way in which they might intersect with labour supply decisions.

Individual characteristics

Gender

Studies tend to find higher labour supply elasticities for single women than single men, and for married women than married men.

Age

The labour supply of individuals has also been examined with respect to age, particularly modelling labour supply behaviour over the life-cycle. Labour supply is a lifetime decision-making process, beginning with school, then work and into retirement. Many studies address the effect of age on labour supply decisions by examining a sample consisting of individuals in a particular age bracket.

Education

Education can directly impact upon an individual's labour supply behaviour by altering preferences for leisure and work. Studies find that higher levels of education are associated with higher labour

force participation. However, the studies acknowledge that there are some unobserved factors which may affect the results. Studies have found that those with less education tend to be more elastic in their labour supply decisions.

Health

The adverse effect of poor health on work performance and consequent lower productivity can affect labour supply. The marginal effects of taking preventative measures to improve health outcomes increase the probability of labour force participation.

Household characteristics

The decision to work or participate in the labour force may also be made with consideration to the circumstances of the household. Persons that live alone make decisions individually, while couples make decisions jointly. Empirical studies that focus on women often use relationship status and family characteristics in the estimation of labour supply. The Australian labour supply literature examining joint labour supply decisions for households finds higher elasticities for coupled women than studies focusing on single women.

Labour demand

The decision to participate in the labour force may be influenced by the probability of obtaining a job. This can be affected by the amount of labour demand and the point of the economic cycle. It is consistent with many economic theories that demand side effects help to determine individual labour.

Labour supply responses to an increase in minimum wages

The review finds that there are many factors that can affect the labour supply decision. They include individual or household characteristics, financial and non-financial benefits, as well as perceived chances of obtaining work. Some population subgroups have been found to be more responsive to wage changes, such as females (particularly partnered females), and these subgroups are also more likely to be award-reliant and therefore more likely to respond to minimum wage changes.

This review has found relatively few research papers on the labour supply responses to increases in minimum wages, both in Australia and internationally. Findings from empirical studies reviewed were ambiguous and varied in their methodology. Therefore, more research is needed to better understand the supply side effects of an increase in minimum wages, as a review of the literature has shown that the effects are quite different for particular segments of the population.

Introduction

The Minimum Wage Panel (Panel)¹ of the Fair Work Commission (FWC) is required under the *Fair Work Act 2009* (Cth) (Fair Work Act) to conduct an annual wage review, during which it may set, vary or revoke one or more modern award minimum wages² and must make a national minimum wage order which sets specific wages for award/agreement free employees.³ In conducting the review, the Panel is required to establish and maintain a safety net of fair minimum wages in accordance with the minimum wages objective, as outlined in s.284 of the Fair Work Act.⁴

In the Panel's research program (confirmed on 25 October 2012⁵) the Panel requested research which would provide:

... literature on the supply responses to increases in minimum or otherwise low wages, with an emphasis on the size and direction of the responses and the groups most likely to respond.⁶

Labour supply was addressed as an area of research to better understand the effects of minimum wages on employees in Healy et al. (2011:35).

A review of labour supply responses to increases in minimum or otherwise low wages relates to both the minimum wages (s.284) and modern awards (s.134) objective in the Fair Work Act. Sections 284(1)(a) and (b) of the Fair Work Act provide:

- (1) The FWC must establish and maintain a safety net of fair minimum wages, taking into account:
 - (a) the performance and competitiveness of the national economy, including productivity, business competitiveness and viability, inflation and employment growth; and
 - (b) promoting social inclusion through increased workforce participation;
- ...

Sections 134(1)(c) and (h) provide:

- (1) The FWC must ensure that modern awards, together with the National Employment Standards, provide a fair and relevant minimum safety net of terms and conditions, taking into account:
 - ...
 - (c) the need to promote social inclusion through increased workforce participation; and
 - ...

¹ From 1 January 2013, the *Fair Work Amendment Act 2012* (Cth) amends the *Fair Work Act 2009* (Cth) to change the name of Fair Work Australia to the Fair Work Commission. In this report, a reference to the Minimum Wage Panel is a reference to the Minimum Wage Panel of Fair Work Australia for the period before 1 January 2013 and the Minimum Wage Panel of the Fair Work Commission for the period from 1 January 2013.

² *Fair Work Act 2009* (Cth), s.285(2)(b); see also s.284(3) and s.284(4).

³ *Fair Work Act 2009* (Cth), s.294(1)(a), s.294(3), s.294(1)(b) and s.294(4).

⁴ *Fair Work Act 2009* (Cth), s.284(1) and s.284(2).

⁵ [2012] FWA FB 9095 (25 October 2012).

⁶ [2012] FWA FB 8286 (25 September 2012) at Attachment A.

(h) the likely impact of any exercise of modern award powers on employment growth, inflation and the sustainability, performance and competitiveness of the national economy.

Pursuant to the direction of the Panel, this paper provides a review of labour supply responses to increases in minimum or otherwise low wages. In doing so, the paper finds that studies in this area of research are limited. This may be because the labour supply response is partly related to labour demand, and measuring labour supply independent of labour demand proves to be difficult.

Research papers into labour supply responses to minimum wage increases have not been as frequent as research into the relationship between labour supply and wages, or taxes. Studies of the effects of minimum wages tend to focus on labour demand rather than labour supply (Bredemeier & Juessen 2012). Studies on low-income groups tend to examine the labour supply elasticities resulting from policy changes such as changes to the tax/transfer system, rather than wage increases.

The review also found few Australian studies covering this topic, resulting in an added reliance on international literature. However, different workplace relations systems across countries can make consistent comparisons between studies difficult. Notably, Australia's distinct minimum wages framework (with its system of awards providing a series of worker classifications or levels which can generally be equal or greater to the national minimum wage) make the comparability of Australian literature with other countries (particularly those with only one statutory minimum wage) difficult. Dandie and Mercante (2007) note the absence of available data has meant that Australian studies on labour supply have only been undertaken since the 1980s.

This report is divided into three chapters. Chapter 1 provides a theoretical discussion on labour supply and features models used to estimate labour supply elasticities, Chapter 2 discusses the factors that affect labour supply, and Chapter 3 summarises the literature on labour supply responses to increases in minimum wages.

1 Economic theory on labour supply

This Chapter presents a theoretical discussion on labour supply and examines empirical methods used to model labour supply behaviour.

1.1 Describing labour supply

Labour supply can be considered a decision that involves two stages. The first, known as the extensive margin, is the decision to seek work and participate in the labour force. The second, known as the intensive margin, is the number of hours an individual decides to supply for work (Dandie & Mercante 2007). The intensive margin can only be estimated for workers, while the extensive margin also includes estimates for non-workers. Wessels (2001) contends that the effect of a minimum wage increase is best estimated by its impact on the labour force participation rates, or at the extensive margin.

A common measurement of labour supply is the participation rate: the proportion of the population participating in the labour force. The Australian Bureau of Statistics (ABS 2012) defines the labour force to include a person who is either employed, or unemployed and actively looking for work (or waiting to start a new job). It is important to note that labour supply is not employment, and that changes in labour supply are not identical to changes in employment.

In a perfectly competitive labour market, a firm can hire as many workers as it wants at the market wage rate. The extra output, or product, contributed by each additional worker will vary (Varian 1993). In the short-run, firms will continue to hire workers until the marginal productivity (the extra output from a small increase in the labour input) is equal to the wage rate.

Under this marginal productivity theory of wages, a change in the market wage rate implies a change in the marginal productivity of workers. If government regulation, such as the introduction of a minimum wage law, causes wages to rise while productivity remains constant, firms will reduce labour in order to bring labour costs back to a level equal to the marginal productivity of labour (Cahuc & Zylberberg 2006).

The marginal productivity theory is focused on the demand for labour and ignores labour supply (Hausman 1990) and imperfect labour market conditions which can limit the downward flexibility of wages (Brown & Nolan 1988). Analysis of the elasticity of labour supply, whether in regards to the number of hours worked or participation in the labour force, is represented by the effect of an exogenous shift in the wage (holding other factors constant) on a person's willingness to work. This exogenous shift in the wage will also generate an exogenous shift in the marginal productivity of the worker.

Labour supply models assume individuals assign their time between two states: work and leisure. Individuals are able to choose the amount of work and leisure to maximise their utility, subject to a budget constraint (Varian 1993).⁷ Utility is expected to increase with income and decrease with hours of work (Creedy & Kalb 2005a). Some models incorporate home production, which includes domestic activities and is considered to be part of leisure (Apps & Rees 1996). Buddelmeyer and Kalb (2008) note that expected utility increases with an increase in leisure (and home production), and households maximise utility by choosing the amount of leisure and labour supply for each adult.

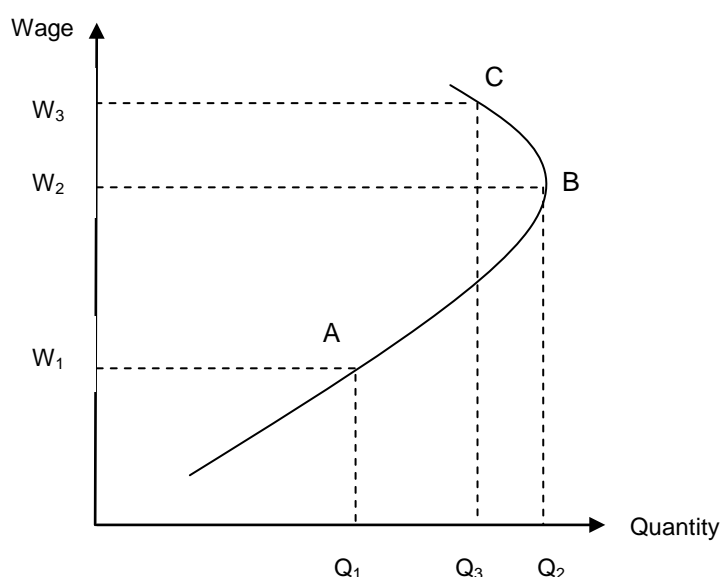
⁷ In economics, utility is a representation of preferences over a set of goods or services (Varian 1993).

An increase in wages can have two competing effects for workers—the income effect and the substitution effect:

- The income effect: an increase in wages will increase the income an individual can earn from the same number of hours worked. As a result, the individual will choose to work fewer hours and increase leisure.
- The substitution effect: an increase in wages will raise the financial incentive of working more hours and the individual will choose to work more hours. In this instance, the opportunity cost of not working—which is measured by the wages given up to enjoy time spent as leisure i.e., the price of leisure—has increased.

The effects are illustrated in Figure 1. The figure shows that for an individual at point A, the labour supply curve is upward sloping and the wage elasticity is positive, therefore an increase in the wage rate will lead to an increase in labour supply. In this instance, the substitution effect is greater than the income effect. The individual may continue increasing their hours with wages until they reach point B. Beyond this point, they are likely to reduce the hours of labour supplied. For instance, at point C, the labour supply curve is backward-bending and the wage elasticity is negative, therefore an increase in the wage rate will lead to a decrease in the labour supplied. At this point, the income effect is greater than the substitution effect. However, workers willing to decrease their labour supply in response to a wage increase are more likely to be earning higher wages. Similar behaviour among low wage workers may therefore occur in response to demand effects or an increase in other competing effects, such as an increase in government benefits or as result of greater educational opportunities. These effects must have improved more than the wage for labour supply to decrease. For example, if the wage rate for better qualified and higher educated people increases at a greater rate than the minimum wage, this may make the investment in education and study more attractive than employment at the minimum wage.

Figure 1: The labour supply curve



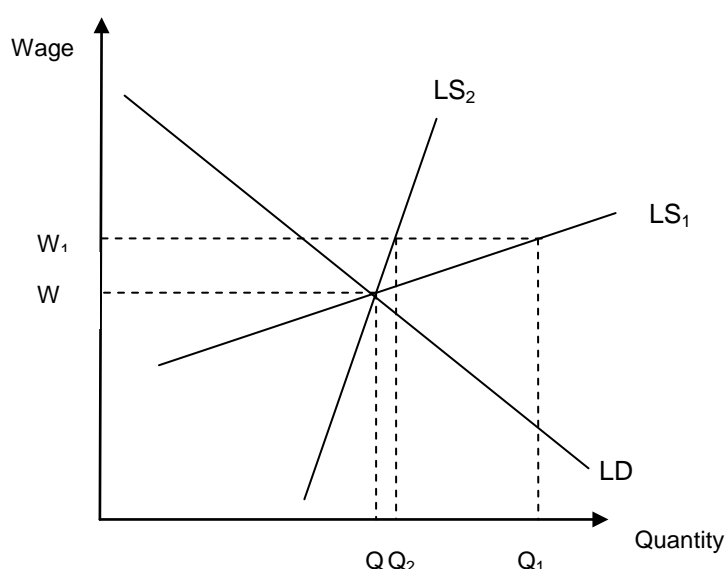
As a result, the overall labour supply response for the individual is ambiguous and depends on the sizes of the competing income and substitution effects (Dandie & Mercante 2007). In effect, labour

supply increases when the substitution effect is stronger and decreases when the income effect is stronger. The strength of these competing effects determines the labour supply elasticity. When the substitution effect is greater, the elasticity is positive. When the income effect is greater, the elasticity is negative and the labour supply curve is considered to be 'backward-bending'.

Measuring the size and direction of labour supply responses to increases in minimum wages (and other changes in variables) is performed by estimating a labour supply elasticity. The labour supply elasticity is calculated as the percentage change in the supply of labour in response to a one per cent change in wages. It is a relative measure, rather than an absolute measure.

Figure 2 shows that the size of the labour supply response will depend on the elasticity of the labour supply curve. In the figure, wages increase from W to W_1 . At LS_1 , labour supply is relatively more elastic, meaning that an increase in the wage will lead to a relatively larger (and positive) response at Q_1 than for curve LS_2 , where the labour supply curve is relatively inelastic.

Figure 2: Labour supply elasticities



Labour supply differs across individuals. Factors that can affect an individual's decision to increase their labour supply include financial and non-financial benefits of work, the tax/transfer system, the fixed costs associated with working, individual and household characteristics, as well as labour demand and the economic climate. These factors are discussed in Chapter 2.

1.2 Modelling labour supply

This Section describes the different types of models used to estimate labour supply elasticities. Killingsworth (1983) first categorised labour supply studies into first and second generation studies. Many studies have since followed this approach, extending their categorisation to include the more recent contribution of third generation models. Kalb (2003) and Dandie and Mercante (2007) provide a review of the three types of approaches used to model labour supply. As modelling has evolved, studies have been able to deal with more of the problems related to estimation (Dandie & Mercante 2007).

The standard neo-classical model forms the basis for the first, second and third generation models. First generation models are often described as being simple models with linear budget constraints, and can only estimate the intensive margin (Birch 2005; Cavagnoli 2012; Dandie & Mercante 2007). Most of the first generation studies incur model specification and econometric problems, such as sample selection bias. In modelling labour supply, sample selection bias occurs as hours worked or wage rates and the probability of being employed or of being a labour force participant are inter-related. More specifically, the dependent variable, given as hours or wages, is non-randomly selected because the probability of being employed is jointly determined by the number of hours worked. Potential bias arises as a result of the exclusion of non-working individuals from the sample. Hence, the sample of those that do supply hours results in an overstatement of the desire to supply hours of work beyond that of the population (Fitzpatrick & Lester 2009). In most of these models, the selection of the sample used to estimate labour supply is based on factors endogenous⁸ to labour supply (Birch 2005; Dandie & Mercante 2007; Evers, de Mooij & van Vuuren 2008; Heim & Meyer 2003; Mroz 1987).

Second generation models use modelling techniques to correct for selection bias and can be used to estimate the extensive and intensive margins (Birch 2005; Dandie & Mercante 2007; Evers, de Mooij & van Vuuren 2008). However, the model does not restrict working hours to a confined set of choices and instead workers or potential workers are able to choose from a continuous number of hours worked. In contrast, third generation models treat labour supply as a discrete choice, limiting the number of choices for the individual who can only choose from a set number of hours categories rather than a continuous choice of hours. For example, choices are made between not working and particular categories of hours of work, such as full-time and part-time. An advantage of this form of modelling is that it can incorporate more complex budget constraints, such as non-linear taxes, fixed costs of working, unemployment benefits and other income sources. These additional factors assist in understanding the response of individuals to wage increases and also, importantly, the reaction of low wage workers who are not working, to changes in wages. As a result, the effects of wage, tax or benefit changes on participation and working hours can be analysed (Breunig, Cobb-Clark & Gong 2008).

Overall, it is clear that second and third generation models are superior to first generation models. First generation models estimate labour supply at only one point—for a particular group of workers. Labour supply needs to be considered for all possible individuals who could potentially supply their labour, including those who currently choose not to work. Hence, third generation models are more advanced in that they are capable of generating a greater range of responses at different points of the distributions of wages—allowing a better focus on population subgroups and for those who work full time, part time and not at all.

A comprehensive review on the economic framework of labour supply models can be found in: Birch (2005); Blundell and MaCurdy (1999); Dandie and Mercante (2007); Evers, de Mooij and van Vuuren (2008); Killingsworth and Heckman (1986); Myck and Reed (2006); and Pencavel (1986).

⁸ Endogenous variables are variables that are determined by the economic model, in this instance the independent variable is correlated with the error term in a regression model, implying that the regression coefficient is biased. Heim and Meyer (2003) show that estimating an ordinary least squares (OLS) equation, where hours of work are regressed on variables such as wage and income measures, ignores a serious reverse causality problem. That is, the after tax wage included in the equation is affected by the number of hours that an individual works and thus the error term will be correlated with the wage and other income variables.

In addition to the models used and their assumptions, these papers also provide a summary of other factors likely to affect elasticities, explaining that:

- labour supply elasticities can be measured over a single period (static model) or over multiple periods (life-cycle, intertemporal or dynamic models) (Myck & Reed 2006);
- studies can differ in their definition of the wage variable, such as gross or net wages, while others use total income (Dandie & Mercante 2007);
- different explanatory variables and controls can also lead to differences in estimates (Blundell and MaCurdy 1999; Evers, de Mooij & van Vuuren 2008);
- different individual and household characteristics face different considerations in their labour supply decisions and are often estimated separately (for example Kalb 2003); and
- institutional factors can affect responses to increases in minimum wages. For instance, the Australian industrial relations system differs from wage-setting practices in other countries, making it difficult to compare results (Dandie & Mercante 2007).

Evers, de Mooij and van Vuuren (2008:26) note that, because of the large number of estimates and methodologies used to estimate labour supply elasticities, there is little agreement as to the correct estimate to be used for policy analysis.

2 Factors affecting labour supply

This Chapter discusses the issues that can affect an individual or a household decision to work, with a focus on Australian literature. The reasons for a person to seek work and the hours they would choose to work are varied. They can range from a person's individual or household characteristics, financial and non-financial benefits, as well as their perceived chances of obtaining work. The sections of this Chapter are divided into the following categories:

- Wages and financial benefits of work
- Disincentives created by the tax/transfer system
- Non-financial benefits of work
- Costs of work
- Individual characteristics
- Household characteristics
- Labour demand

When estimating labour supply elasticities, models include some of these factors as variables in their equations. Of course, not all factors that affect labour supply are canvassed in this Chapter, nor can they be incorporated in all models, as they can be too difficult or extensive to determine and calculate. This is because individuals are not homogenous and the reasons for participation in the labour force can vary from person to person.

2.1 Wages and financial benefits of work

A primary motivation in the labour supply decision is the potential income that can be attained. Paid work provides the means to meet essential needs such as food, housing and clothing. Through income other resources can also be improved, such as access to a broader range of goods and services, the capacity to save and/or meet debt repayments and access to credit. These positive outcomes associated with paid work have been considered to be contributors to social inclusion (Nelms & Tsingas 2010).

Income from earnings helps protect against low standards of living. For example, Hahn and Wilkins (2008) explore living standards using the Household, Income and Labour Dynamics in Australia (HILDA) Survey and conclude that when employed, only a small proportion of adults experience a low standard of living. Less than one per cent of adult employees are found to have low living standards (defined as having less than 60 per cent of median (equivalised) income, wealth and consumption). Less than six per cent of those earning less than 120 per cent of the then Australian Federal Minimum Wage (now national minimum wage) are found to experience low living standards (Hahn & Wilkins 2008:34, calculation from Table 16).

Changes in wage rates can have ambiguous effects on the labour supply decision, based on the relative strengths of the income and substitution effects and on the preferences of the individual. Wage rates are incorporated into models designed to explain both the decision to work (or participate in the labour force) and the number of hours worked. Australian research that estimates the participation elasticities with respect to wages includes Kidd and Ferko (2001), who find positive effects for men and women, and Scutella (2000) who finds positive effects for married women. Australian research that finds positive effects on hours of work resulting from a wage increase include Apps and Rees (1999) and Buddelmeyer and Kalb (2008).

Reservation wages are a concept utilised in models of labour supply and labour force participation. The reservation wage is defined as the lowest wage that a person engaged in searching for a new job is willing to accept (Black, Hashimzade & Myles 2009). When the market wage is below the reservation wage, a person will not participate in the labour force. Or, in the case of minimum wages, if an individual's reservation wage is above the minimum wage, and this is the wage they would likely receive if employed, then they will not seek employment. If the minimum wage is above a person's reservation wage, then this would be an incentive to seek work. A higher reservation wage implies that the individual requires more financial incentive to choose to seek work (McConnell, Brue & Macpherson 2009). Kalb (2003) notes that the probability of exiting unemployment is determined by the wage rate on offer being higher than the reservation wage.

The presence of statutory minimum wages (that is, minimum wage levels set as a legislative minimum) has been shown to raise reservation wages. Minimum wage levels can influence perceptions about what is considered to be a 'fair' wage, causing workers to reject wage offers that they would have accepted in the absence of statutory minimum wages (Falk, Fehr & Zehnder 2006). However, Australian research on the relationship between reservation wages and other aspects of labour supply behaviour, such as labour market participation and duration of unemployment, has been somewhat inconclusive. For example, Gray and Renda (2006) compare the reservation wages of Australian non-employed partnered and lone mothers who would like to work with their estimated earnings capacity. They find that approximately one-third of couple and lone mothers surveyed could not estimate their reservation income (Gray & Renda 2006:7). This was due to one of two reasons: either the respondents were unable to estimate how many hours they would expect to work, or else they could provide a number of expected hours but could not estimate how much they would need to be paid to make working those hours worthwhile (Gray & Renda 2006:6). The authors suggest that if income support recipients are unable to estimate what they would need to earn to make it worthwhile accepting a job, then they would be unresponsive to tax/transfer changes that might increase disposable income.

The effects of a minimum wage are also determined by the wage distribution prior to the introduction of, or change in, a minimum wage (Neumark, Schmeitzer & Wascher 2004). Some studies use a measure of how 'binding' the minimum wage is; that is, the proportion of employees who are likely to be affected by any change to the minimum wage (such as Wessels 2001). In industries, occupations or geographic areas with relatively high average wages, a smaller fraction of employees are at the bottom of the wage distribution, and consequently minimum wage rates are less binding in some segments of the labour market (Singell & Terborg 2007). The overall labour supply effects of an increase in the minimum wage may therefore depend on whether the minimum is strongly binding or weakly binding. Other forms of income may also affect the labour supply decision. Hall and Vella (1992) argue that treating wages as the price of labour may not be appropriate because of non-wage income. This would also affect the relationship between wages and hours worked, or between wages and the hourly marginal product.

2.2 Disincentives created by the tax/transfer system

The Australian social security system supports families on low incomes using targeted benefits and tax concessions. However as private earnings increase, income tests applied to benefits mean these benefits are reduced or withdrawn while income tax increases. It is this interaction of the tax/transfer system with wages that can provide disincentives that may offset the financial benefits of work, and therefore may affect labour supply decisions (Dockery, Ong & Seymour 2008; Harding et al. 2006; Kalb 2007).

Some Australian qualitative research has found that the loss of benefits can act as a considerable disincentive to finding employment or seeking additional hours. One study (Colmar Brunton Social Research 2006) explores the role of the tax/transfer system in labour supply decisions and finds that government benefits were not reported by individuals as a significant factor in decisions about work. However responses provided by participants indicated that actual behaviour was influenced by a desire to preserve benefits already being received. Participants in a range of household types reported working within threshold levels to retain benefits such as childcare subsidies, a Health Care Card or Rent Assistance or, in the case of unemployed couples, loss of benefits had been a disincentive to become employed. In another study (Southwell et al. 2010), respondents expressed that from a personal development and wellbeing perspective, being in paid employment was preferable to being dependent on income support. However respondents also indicated that with an uncertain labour market the incentive to work was reduced relative to the security of regular (although lower) income support payments.

In a study involving 44 interviews with Newstart and Parenting Payment recipients, most participants revealed an awareness of how income support payments would be impacted by earnings from paid work, and many factored this in when choosing the 'optimal' number of hours they needed to work to maximise their total income. These financial effects were often considered alongside other factors such as care of children and non-financial benefits of paid work (Bodsworth 2010).

One common measure of work disincentives is effective marginal tax rates (EMTRs). This refers to the percentage of an additional unit of earned income (typically \$1) that is forfeited to income tax and reductions in cash transfers.⁹ Higher EMTRs therefore have the potential to discourage individuals from supplying their labour or low-paid workers from increasing their working hours. Kalb (2007) finds that 5.6 per cent of individuals had an EMTR over 70 per cent in January 2007, and would therefore retain only 30 cents of each additional dollar earned. Studies in Australia have found that the effect of the tax/transfer system may be more likely to affect the labour supply of particular household types as they are found to experience higher EMTRs than other households. For example:

- couples with dependent children (Harding et al. 2009; Kalb 2009);
- single parents (Harding et al. 2009; Whiteford 2009);
- middle income earners, that is, incomes in the middle 40 per cent of the Australian income distribution (Harding et al. 2009); and
- households earning just below particular thresholds, for example households earning just below the point at which the Medicare levy surcharge add one per cent tax over all income for individuals earning over the threshold will face more than 100 per cent EMTR (Kalb 2007:190).

Dockery, Ong and Seymour (2008) find that part-time minimum wage workers have 'significantly blunter' work incentives than their full-time counterparts. As opposed to modelling hypothetical households, the authors used HILDA data to model incentives of predicted minimum wage workers among the non-employed sample based on their estimated disposable income. They estimate the

⁹ For example, an EMTR of 60 per cent means that 40 cents in every dollar is retained.

mean replacement rate¹⁰ for non-employed individuals at almost 80 per cent. That is, by not working they receive 80 per cent of the disposable income they would receive if taking up a part-time minimum wage job (and this does not account for any costs of work that may be incurred which may further exacerbate this disincentive). For those moving into a full-time minimum wage job, incentives were better (a mean replacement rate of 68 per cent). However in looking at the distribution of replacement rates, it was shown that for over one-third of the non-employed persons predicted to commence a full-time minimum wage job, replacement rates were in excess of 75 per cent (Dockery, Ong & Seymour 2008:199–200). Harding et al. (2006) also find financial disincentives to increasing hours for part-time minimum wage workers in some household types modelled.

2.3 Non-financial benefits of work

There are also a range of non-financial incentives that may be perceived by an individual as a benefit of work and affect their labour supply decisions.

The social benefits of workforce participation may provide an incentive to supply one's labour. The workplace can provide the opportunity to expand an individual's social networks. These relationships may represent a social outlet and a source of emotional support and affirmation (Godin & Kittell 2004) as well as being important for future labour market outcomes (see for example, Marin 2012; McDonald 2011; Stone, Gray & Hughes 2003).

Work can provide a source of identity, a way in which individuals perceive and define themselves. It may provide mental stimulation and offers a potential source of self-esteem, a sense of purpose and belonging, enhanced self-efficacy, and a chance to contribute to shared goals (Nelms & Tsingas 2010). Some parents may consider engagement in paid work as a means to provide a good role model for their children (Bodsworth 2010).

2.4 Costs of work

There are both financial and non-financial costs of work. Non-financial costs include the opportunity cost of not being able to choose more time for leisure or home production. In the labour-leisure model, the opportunity cost of working is the value of leisure. That is, given a fixed amount of time, the more hours of work that are performed, the fewer hours remain in which to consume leisure. More specifically, opportunity costs may also arise in limiting the number of hours an individual may wish to spend on other activities, such as study or caring responsibilities (Gilfillan & Andrews 2010; McConnell, Brue & Macpherson 2009).

A major financial cost associated with engagement in work for parents is childcare. While government provides support through, for example, the means-tested Child Care Benefit and Child Care Rebate, out-of-pocket expenses are incurred by many families.

As discussed in Section 2.2, the tax/transfer system affects disposable income and some studies have shown that it can create disincentives that may affect labour supply decisions. The amount of income retained by a household may be further reduced after factoring in childcare costs, as

¹⁰ A replacement rate is the proportion of disposable income retained when a person is out of work. It represents the disposable income an individual would receive while not employed as a proportion of disposable income when employed. A higher replacement rate means a lower incentive to work. An increase in the minimum wage, in the absence of other changes, would mean a lower replacement rate and therefore a greater incentive to work.

illustrated by NATSEM modelling of household disposable income that also took into account net childcare costs of long day care (Daley 2012). Daley finds that for a dual earner family with one child with jobs earning \$40 000 at the full-time rate, the second earner retains 33 per cent of income from the first three days worked in the week and 35 per cent from the fourth and fifth day. In a household with two children the corresponding proportions of income retained are reduced to 20 and 17 per cent (Daley 2012:47).

The expense of childcare is one cost of work that has been researched in relation to its effect on labour supply. In a review of the effect of increases in childcare costs in Australia, Kalb (2009) reports that the effect differs according to household type, where low wage households and those with children under school age are the most responsive and most likely to see a reduction in the labour force participation of mothers.

Breunig, Gong and King (2012) report that while some recent Australian studies have found that the labour supply of partnered women is not particularly sensitive to the cost of childcare, this can be explained by the measurement error in the way in which the price of childcare is constructed. They construct a childcare price which takes into account the actual hours spent in childcare and price heterogeneity for childcare for different age ranges. They find childcare price elasticities to have a statistically significant and negative effect on a partnered mother's labour supply: for every one per cent increase in the average childcare price, her rate of employment would decrease by 0.29 per cent, and her working hours would decrease by 0.65 per cent (Breunig, Gong & King 2012: 62).

Beyond childcare, there is little Australian research focusing on the costs of work such as uniforms, equipment and transport, particularly the way in which they might intersect with labour supply decisions. Costs of work emerge regularly as an issue in studies about barriers to work (for example, Bodsworth 2010) however no studies have been found that quantify these or test the importance of the costs of work in labour supply.

The costs associated with travel to and from work (or in job searching) or to carry equipment for work are ongoing and therefore perhaps more likely to affect labour supply. However while transport costs are discussed in various studies in general terms about how they might limit employment opportunities, there are no findings directly linking transport costs with labour supply. Two literature reviews of transport and disadvantage note this research gap (Dodson, Gleeson & Sipe 2004; Rosier & McDonald 2011).

2.5 Individual characteristics

A range of individual characteristics may affect the labour supply decision and are included as explanatory variables in models of labour supply behaviour. These characteristics may help to determine the differences in behaviour between individuals with similar wages (Creedy & Kalb 2005a). These include age, gender, education and health, and will be discussed in this Section.

2.5.1 Gender

The labour force participation rates for males and females in Australia are different, yet over time have been converging. Gender is also a factor for the types of employment, as part-time employees have greater scope for increasing the hours they engage in paid work and females are more likely than males to be part time (Rozenbes 2010). Females are also more likely to be

award-reliant (Pointon et al. 2012) and therefore may be more likely to respond to changes in the minimum wage than males.

In their reviews of empirical literature, Evers, de Mooij and van Vuuren (2008) and Killingsworth and Heckman (1986) note that studies tend to find that the elasticity for women is greater than for men. Creedy and Kalb (2005b) find a higher labour supply elasticity for single women than single men, and for married women than married men (Apps and Rees (1996) also find this for married women and men). The labour supply elasticity at the extensive margin (participation) tends to exceed the intensive margin (hours of work). Evers, de Mooij and van Vuuren (2008) note that the higher elasticity at the extensive margin may explain the larger elasticity found for women, who tend to have lower labour force participation than men. Lower female labour force participation implies a higher proportion of adult females with zero hours of work. Consequently, a change in the wage rate that induces a decision to participate will result in a large change in labour supplied (moving from zero hours to positive hours) (Chetty et al. 2011). In contrast, a change in the wage rate that induces an increase in employed persons' hours of work may result in a small non-zero change in labour supplied (moving between two positive hours points). Heckman (1993) notes that models of male labour supply in the 1960s typically used observations on hours of work for men. Men working more hours at higher wages are unlikely to be responsive to changes in income and wages, resulting in 'virtually all' of the wage responsiveness occurring at or near the zero hours point.

Women, particularly mothers with children under school age, usually face greater fixed costs to entering the labour market (as discussed in Section 2.4) and their participation decisions are relatively inelastic with respect to wages. However, Blau and Kahn (2007) note that as the participation rate of women increased towards that of men between 1980 and 2000, the elasticity for women converged towards the elasticity for men.

Birch (2005) notes that studies generally show Australian women to have an 'm' shaped pattern of labour supply over their lifetime, corresponding to a peak before childbirth, followed by a decline after having children, then increasing when children attend school and falling again as women near retirement.

2.5.2 Age

The labour supply of individuals has also been examined with respect to age, particularly modelling labour supply behaviour over the life-cycle. Blundell and MaCurdy (1999) note that labour supply is a lifetime decision-making process, beginning with school, then work and into retirement and that life-cycle models are needed to evaluate policy changes.

Other papers to have examined labour supply behaviour over the life-cycle include Heckman (1974), Alogoskoufis (1987), Pistaferri (2002) and Ziliak and Kniesner (2005). These studies estimate the intertemporal elasticity of substitution to address questions about how labour supply responds to anticipated or evolutionary wage growth (Pistaferri 2002). Life-cycle models addressing questions about how labour supply responds to unanticipated wage changes, referred to as parametric shifts, require specification of an individual's wage and income profiles over time (Blundell & MaCurdy 1999). The estimation of parameters used in these models requires data not readily available (such as information on wages outside a sample time period) and relies on strong assumptions about how workers respond to new information that alters the wage path at all ages (MaCurdy 1981). Examples of these papers include MaCurdy (1983), Hotz, Kydland and Sedlacek (1988) and Li and Sologon (2011).

In their review of labour supply literature, Dandie and Mercante report that they 'know of no Australian studies which consider the change in elasticities over time' (2007:26). Kalb (2003) argues that one of the difficulties for Australian researchers conducting this type of longer-term analysis is the availability of reliable and contemporary longitudinal data.

Many studies address the effect of age on labour supply decisions by examining a sample consisting of individuals in a particular age bracket. Scutella (2000) finds a positive association between married women's age and the size of hours-of-work elasticities across four age groups: under 25, 25–34, 35–44 and 45+ years. In the United States (US), teenagers have been examined with regards to minimum wage changes, as teenagers are more likely to be earning lower wages (Ahn, Arcidiacono and Wessels 2006; Giuliano 2013; Wessels 2001) and these studies are examined in Chapter 3.

As workers age, they are expected to alter their workforce participation decisions as a result of personal preferences for retirement, or working fewer hours. There may also be health considerations that impact upon capacity for work and financial resources allowing older workers to work less, such as wealth accumulation and other non-labour income (e.g. social security or pensions). O'Brien (2000) examines trends in labour supply for older males aged 55–64 in Australia. The author tests a model of labour force participation that uses the accumulation of private wealth, pension value and labour demand constraints as explanatory variables, and shows that the major influence on the participation of older men is labour demand constraints.

2.5.3 Education

Labour supply research often includes a measurement of an individual's level of educational attainment or training. Education can directly impact upon an individual's labour supply behaviour by altering preferences for leisure and work (Birch 2005). There is also an indirect effect on participation and hours-of-work decisions, with higher education leading to greater productivity and higher market earnings, other things being equal (Quiggin 1999). Kalb (2002) finds that more education increases the preference for work, and that education is more important for females than males, as female labour supply is more variable.

Laplagne, Glover and Shomos (2007) estimate the effects of education on the probability of labour force participation, finding that higher levels of education are associated with higher labour force participation. The correlation between educational attainment and labour force participation was stronger for females than males. Kennedy, Stoney and Vance (2009) find a strong positive correlation between labour force participation and education in Australia. However, both of these studies acknowledged that there are some unobserved factors which may affect the results and therefore labour force participation. Individuals may choose higher levels of education due to other reasons, such as motivation, ability and preferences. As such, the findings should be interpreted with caution as the results may suffer from selection bias.

Studies have found that those with less education tend to be more elastic in their labour supply decisions (Gourio & Noual 2009). Scutella (2000) examines married women's labour supply disaggregated by educational qualification. Of the five qualification levels observed (postgraduate, undergraduate, diploma, vocational and no qualification) women with vocational educational qualifications are found to have the most elastic response with respect to wages, followed by women with no qualification. However, researchers caution that the specification of the education variable in labour supply models may result in substantially different elasticity estimates. Trostel & Walker (2006) note that treating education as an exogenous variable that affects an individual's

rate of pay, but not their hours of work, may result in overestimation of the effect of wage rate on labour force participation.

Higher levels of education can also help people with job loss, as long periods of unemployment can lead to skill atrophy and discourage people from searching for employment (Kennedy, Stoney & Vance 2009). Higher education may act as a signalling device that offsets the stigma some employers associate with a period of unemployment, reducing the probability of a worker exiting the labour force (see Psacharopoulos 1979 and Arkes 1999 for a discussion of educational levels as a signalling device). Theory predicts that education also improves labour mobility, as better educated individuals are more efficient searchers and have a comparative advantage in learning new skills and technologies (Börsch-Supan 1990). Using Australian cross-sectional data, Shah (2009) investigates transitions from job separation and finds evidence that qualifications are significant in explaining some types of occupational mobility. For example, qualifications are significant for women's exit from the labour force following job separation, but insignificant for transitions to unemployment (2009:14).

Human capital can also be developed through engagement in paid work. Work experience in conjunction with skills, education and training can improve one's prospects for other employment and future earnings (Nelms & Tsingas 2010).

2.5.4 Health

Health conditions can affect the likelihood of obtaining and retaining employment. This is in large part due to the adverse effect of poor health on work performance and consequent lower productivity (Cai & Kalb 2006).

Some studies have examined the effects of better health on the likelihood of labour force participation in Australia. For example, Laplagne, Glover and Shomos (2007), using panel data for individuals aged between 15 and 64, find that the marginal effects of taking preventative measures to improve health outcomes increases the probability of labour force participation. The authors also model several health conditions that lower the probability of participation in the labour force and find that mental/nervous health conditions have the greatest negative impact on participation, followed by major injury (2007:37). Using cross-sectional data, Cai and Kalb (2006) model the probability of labour force participation across five categories of health, ranging from 'poor' to 'excellent'. The effect of a deterioration of health on labour force participation is stronger for older people aged 50–64 compared with those aged 15–49. The effect is also larger for females than males in a particular age group (2006:250–252).

Some studies find an association between health problems and higher reservation wages. Theory predicts that individuals in poor health will have higher reservation wages (Brown, Roberts & Taylor 2010) as time outside of the labour market is valued more highly when an individual is unwell, due to the time required to improve his or her health. Another consideration may be the increased income support associated with a health condition or a permanent disability, which may increase an individual's replacement rate. Gourio and Noual (2009) find that having a medical condition increases the reservation wage. However, Brown, Roberts and Taylor (2010) do not find that individuals with health problems have higher reservation wages. The authors' findings suggest that instead 'the main role of poor health is to weaken labour force attachment', highlighting the differences in results when people who show weak attachment to the labour market are included in the data set.

A related strand of literature focuses on the effects of disability for labour market outcomes. Wilkins (2002) acknowledges that the Australian literature on the extent of labour market disadvantage and labour supply behaviour of persons with disability is limited. One focus group based Australian study (Morris 2006) finds that those with disability may perceive discrimination by potential employers to be an obstacle to employment. However, the limited evidence available suggests that disability acts to reduce labour supply rather than labour demand (Wilkins 2004). Using panel data from the United Kingdom, Jones (2006) finds that when the unobserved influence of health on productivity is controlled for, there is no evidence of employment discrimination against a person with disability.

2.6 Household characteristics

The decision to work or participate in the labour force may also be made with consideration to the circumstances of the household. Persons that live alone make decisions individually, while couples make decisions jointly (Bredemeier & Juessen 2012). Empirical studies that focus on women often use relationship status and family characteristics in the estimation of labour supply. Marital status, the number of children and the ages of any children are some examples of variables that affect labour supply behaviour. A number of studies have estimated the labour supply response of different household types (see, for example, Breunig, Cobb-Clark & Gong 2008; Buddelmeyer & Kalb 2008; Creedy & Kalb 2004; and Kalb 2002).

The Australian labour supply literature examining joint labour supply decisions for households finds higher elasticities for coupled women than studies focusing on single women (for example, Buddelmeyer & Kalb 2008).

The decision for one member of a coupled household to participate in the labour force may be affected by the labour force status and income of another member. Dandie and Mercante (2007) find that married women have lower participation rates than men and the decision to work or not is more relevant for them. Married women are also more likely to be employed part time and therefore have more opportunities to increase their hours of work. Dandie and Mercante (2007) also find that married women are more responsive than married men to changes in wages. The estimated elasticity is higher for those with older children, while having more dependent children decreases the elasticity. Estimates of elasticities for single parents are more ambiguous.

Results from Gourio and Noual (2009) show that being married increases the reservation wage for females and decreases the reservation wage of males. That is, males would be more willing to work and females less willing to work when married. However, Gourio and Noual do not suggest any reasons for the negative correlation between female reservation wages and marriage. Others argue that marriage affects individual's own labour supply by creating another occupational choice: 'one choice of occupation being spousal labour' (Grossbard-Shechtman & Neideffer 1997:101). If market labour and spousal labour are substitute types of employment, then the quasi-wage available from spousal labour may drive up an individual's reservation wage (1997:103–104). Household decisions regarding work are also made with regards to caring for other members of the household, such as children or other family members who are unable to work. As such, studies tend to distinguish between couples or singles with and without children (such as Bredemeier & Juessen 2012; Kalb 2002). Kalb (2002) finds that women with more children have a lower preference for work and that single mothers have a lower preference for work than single fathers.¹¹

¹¹ Kalb (2002) analyses preferences for leisure and income and not labour supply directly.

Kalb concludes that couples see each other's labour supply as substitutes, so if one works then the marginal utility of work of the other person decreases. Single parents are found to be more responsive to financial incentives than other groups.

The presence of children is also found to increase reservation wages. For example, Gourio and Noual (2009) examine the response of aggregate hours to an increase in wages and find that females with children have higher reservation wages; the younger the children the higher the reservation wage. Matysiak (2011) notes that the changes in reservation wages are due to the need to provide care for children. Scutella (2000) finds that married women with a child under two years of age are the most responsive to wage changes. Women's responsiveness to changes in wage rates decreases with the number of dependent children.

Gong (2010) finds evidence for the added worker effect using Australian data, where a member of a household participates in the labour force following a negative income shock. However, the paper finds that it is easier for those already working to increase their hours than for those not working to find a job.

The decision to participate in the labour force has also been examined with regards to household debt. Belkar, Cockerell and Edwards (2007) examines whether there is a relationship between labour supply and the increase in indebtedness of Australian households. The study finds that individuals with owner-occupied mortgage debt have a higher labour force participation rate than those without. This was the case for both males and females, however it is found to be stronger for females. While the paper finds a positive correlation between labour force participation and indebtedness, it was also found that increased indebtedness induces greater labour force participation, with the reverse effect not found to be the case.

2.7 Labour demand

The decision to participate in the labour force may be influenced by the probability of obtaining a job. This can be affected by the amount of labour demand and the point of the economic cycle. It is consistent with many economic theories that demand side effects help to determine individual labour (Heckman 1993). In modelling labour supply behaviour, labour demand is accounted for with variables representing output (Schaafsma & Walsh 1983) or the male unemployment rate (Wessels 2001).

Gourio and Noual (2009) find that the labour supply elasticity is countercyclical. Their estimates show that the elasticity after a long boom is relatively low and during recessions it is relatively high. Labour demand has also been found to affect the labour force participation of older men (O'Brien 2000).

Labour demand can have implications for individual hours-of-work decisions. It is often not known if the observed labour supply is the optimal labour supply, or whether individuals are restricted by demand side factors. Kalb (2003) notes that observed labour supply is influenced by labour demand as people do not always work the number of hours they prefer, nor are they asked the number of hours they would prefer to work. Therefore, actual hours worked are normally assumed to be the preferred hours of work (Kalb 2002).

The decision to participate in the labour force can have implications for the household when aggregate labour demand falls. The added worker effect may also be present when there is reduced labour demand. Basu, Genicot and Stiglitz (1999) examine the added worker effect for

individuals who supply their labour in the event their partner loses their job, in order to offset the decrease in household income.

Gong (2010) examines the effect of potential workers losing hope as they cease searching for jobs when they see a lot of unemployment, known as the discouraged worker effect. The study finds the existence of such an effect using Australian data for married women.

The classical model shows that in a perfectly competitive labour market, a minimum wage acts as a price floor which leads employment to be determined solely by labour demand (Ahn, Arcidiacono & Wessels 2006). Some models predict that a minimum wage can increase labour demand by inducing greater labour supply (Giuliano 2013). Greater labour force participation may lead to a greater supply of more productive people entering the labour market and firms may find these potential workers more attractive than other workers and increase their demand for labour.¹² As Giuliano (2013) explains, the new job-seekers that enter the labour force may crowd out those already in the labour force. With more job-seekers and a greater labour force size, firms are more able to fill vacant positions and create new jobs based on the types of people searching for work as it becomes cheaper for firms to find new workers.

¹² This may be the case for people with reservation wages above a minimum wage. After an increase in the minimum wage that may exceed their reservation wage, these workers enter the labour force and, as human capital theory states that these workers set a higher reservation wage as they believe they are better workers, they are more attractive than workers who were receiving the previous minimum wage. This effect may not have a negative effect on employment, but instead may change the composition of employment (Lang & Kahn 1998; Luttmer 2007).

3 Labour supply responses to an increase in minimum wages

In the review of labour supply responses to an increase in minimum or otherwise low wages, relatively few studies were found to examine this issue. Bredemeier and Juessen (2012) note that when examining the economic effects of minimum wages, studies mainly concentrate on labour demand without considering the effects on labour supply, which they remark could be because labour is considered to be inelastic at a full-time basis.

This Chapter discusses the few studies that have examined the effects of an increase in minimum wages on labour supply. As each study is different, they are discussed separately as comparisons are difficult to make. However, the studies are grouped according to their population of interest. Two studies examine the responses by marital status, while the remaining papers focus on age groups, particularly teenagers.

3.1 Marital status

Two papers that examined the labour supply responses of minimum wages by marital status are Bredemeier and Juessen (2012) and Buddelmeyer and Kalb (2008). The studies used a model to estimate the responses over a single period (static model). Labour demand was not incorporated in the studies and assumed to not be affected by the minimum wage increase. Both papers compared the responses of minimum wage or potential minimum wage workers with all workers.

3.1.1 Buddelmeyer and Kalb (2008)

Using the Melbourne Institute Tax and Transfer Simulator (MITTS), Buddelmeyer and Kalb estimate labour supply responses to an increase in the Australian Federal Minimum Wage (FMW) at both the extensive and intensive margins. The groups analysed were partnered males and females, single males and females, and sole parents.

MITTS is a behavioural tax microsimulation model that studies policy changes that affect an individual's financial incentive and can calculate net income at all chosen discrete labour supply points.¹³ The MITTS model assigns a probability of being chosen to each hours point. MITTS uses historical data on individuals' choices with regards to work and leisure to predict the labour supply outcomes. Expected labour supply is then calculated as the sum of the hours of work at the different hours points, weighted by the probability of the points being chosen. The simulation predicts the expected labour supply for before and after the increase in the minimum wage and compares the difference in expected hours of labour supply. The simulated wage increase for those not working is the increase in the wage offer if they were to work. Wages are the observed wage for each working individual, or the predicted wage for those not working.

The model assumes that an increase in the FMW does not affect labour demand, and that there is enough labour demand to meet additional labour supply. The data used for the simulation comes from the ABS 2003–04 Survey of Income and Housing Costs. The sample is representative of the population in 2003–04, wages and incomes are updated using Average Weekly Earnings and the Consumer Price Index to 2008 (the year for which the simulation was carried out).

The sample is limited to those 21 years and older to omit the effects of junior, apprentice, trainee and casual wages (particularly since junior wages cannot be identified) and sets the maximum age

¹³ For more information on MITTS, see Creedy and Kalb (2005a).

at 59 years. The sample also excludes individuals that report an actual or predicted wage of less than \$4 or more than \$125 per hour.

Individuals identified as FMW workers have their wages set at the 2008 minimum wage of \$13.74 per hour, which is increased to \$14.31 in the simulation, for those earning at or near the FMW, and an increase in the wage offer for non-workers whose imputed wages are near the FMW (or those likely to be FMW workers if they were to work).¹⁴ Since MITTS does not include the effects of an increase in the minimum wage on the macro economy, the model does not need to take into account whether the government or employers fund any additional labour costs associated with an increase in the minimum wage.¹⁵ The findings show that all population subgroups increased their labour supply after the minimum wage increase. This is found for both groups estimated: ‘minimum wage workers’ and ‘all employed’. The greatest response in each occasion among minimum wage workers is for sole parents (0.665) followed by partnered women (0.559), who responded the most for all employed. Based on the sample covering the total population, the average overall effect appears to be much smaller, which suggest that the group of minimum wage workers is relatively small.

Table 1: Buddelmeyer and Kalb (2008)—labour supply elasticities

	Partnered men	Partnered women	Single men	Single women	Sole parents
Hours					
Minimum wage workers	0.196	0.559	0.261	0.268	0.665
All employed	0.015	0.025	0.012	0.012	0.009
Participation					
Minimum wage workers	0.183	0.404	0.180	0.140	0.442
All employed	0.015	0.023	0.007	0.007	0.008

Source: Buddelmeyer and Kalb (2008), calculations from Tables 4 and 5, pp. 222–223.

Buddelmeyer and Kalb note that the study would benefit from an update of the dataset and the inclusion of those on wage rates just below or just above the minimum wage, such as those on award wages just above the minimum wage who would benefit from flow-on effects.

3.1.2 Bredemeier and Juessen (2012)

This paper looks at the response of different household types to the introduction of a minimum wage at several hypothetical levels in Germany, which does not have a statutory minimum wage. The minimum wage estimated is not a wage rate, rather it is an effective wage subsidy paid by the Government. It does not affect the gross hourly wage paid by employers who are not affected by this policy. The government makes up the difference between the wage received and the

¹⁴ FMW workers are identified in the 2003–04 Survey of Income and Housing Costs data using the relevant minimum wage valid in the first quarter of 2004. FMW workers are defined as those who are within 50 cents of the FMW of that time (\$11.80 per hour).

¹⁵ Buddelmeyer and Kalb note that if the increase in the minimum wage reduces labour demand, then their elasticities may be overestimated, or even underestimated if the increase in labour supply is met by an increase in labour demand, such as during a tight labour market

introductory minimum wage by taxing other individuals earning higher wages, covering the cost to the increase in the Government's budget.¹⁶

The aim of the paper is to compare the labour supply response of single and married women after the introduction of the minimum wage for women whose initial net wages were below this potential minimum wage. The elasticities are also estimated for men. The model investigates changes at the intensive margin, that is, the change in the hours of work of those already in employment and does not therefore take into account persons that are not working.

Eight different policy experiments are considered, with each scenario differing with respect to the level of the minimum wage, its tax implications and the way in which the subsidy is financed. Bredemeier and Juessen point out that labour supply elasticities differ between males and females and as a result, female labour supply may differ in response to an increase in minimum wages compared with males.

Bredemeier and Juessen estimate a structural model of female labour supply with home production, comparing the effects between single and couple households.¹⁷ In the model, labour supply effects differ between the household types. For single people, the one-person household is considered to have one member who can only react to the introduction of the minimum wage by substituting between home and market consumption. Therefore, the labour supply effect is determined by the elasticity of substitution between these two goods. The findings for single women are aggregated to estimate the response of all single women with hourly net wages below a potential minimum wage.

For the coupled household, the members of the household are distinguished by their wages. Apart from substituting between the two goods, the coupled household can also substitute between the members' time in home production, which the single household cannot. For married women, the characteristics of the husband are also considered and, in this instance, intra-household specialisation may also be an important determinant of labour supply for females. For example, an increase in net wages as a result of the introduction of the minimum wage will reduce the degree of intra-household specialisation and increase the labour supply of married females. The results for the coupled households are also aggregated.

The structural model estimated does not incorporate labour demand effects, as it is assumed that demand effects are expected to be weak since labour costs incurred by the employer remain unchanged. However, they do note that while the policy implemented will not affect the hourly wage paid by the employer, demand effects might occur when it is not possible for individuals to increase their working hours at the constant hourly gross wage rate, although they note that that these quantity effects at constant labour costs will likely be small. Additionally, the model also evaluates the costs of the subsidy at each minimum wage level. The study uses micro data from the German Socio-Economic Panel (known as SOEP) for 25–55 year olds with positive hours worked for 2009. Hourly wages are derived by dividing monthly earnings by monthly hours worked. The sample only

¹⁶ The cost of the policy is also estimated in the paper.

¹⁷ The model incorporates home production and distinguishes between single and couple households. The introduction of the minimum wage induces substitution between home production and market consumption, with the labour supply elasticity determined by the elasticity of substitution between these two commodities. Market consumption reflects the purchase of goods earned through market labour, while home production refers to home goods that are produced at home based on the individual's time in home production. Individuals are allocated 50 hours to divide between the two commodities and are assumed to allocate their resources efficiently.

includes individuals who are married and live with their spouse, or are not married and live alone. Other explanatory variables include age and number of children currently living in the household. Individuals who record allocating more than 50 hours per week to market and home production are dropped from the sample, but their information is used as determinants of their spouses' labour supply.

The eight different scenarios consist of four baseline experiments where the minimum wage level is administered either by a lump-sum or is tax-financed.¹⁸ Three of the experiments consider different gross and therefore net wages, while the fourth experiment also takes into account the tax/transfer system and whether or not there are children in the household. Within the sample, around two-thirds of those in the low wage group are females and around two-thirds of these are married. Females were found to work fewer hours and were more likely to work part time.

The study finds that the labour supply effects on minimum wage recipients were much larger than the total labour supply (minimum wage and non-minimum wage recipients), even for the population subgroups. The findings show that the effect on overall labour supply is relatively small compared with the responses of workers whose wages were previously below the potential minimum wage rate. However, the effects at the population subgroups are greater than the total effect. The positive effects on minimum wage recipients are greater than the negative effects on those in higher wage groups due to being taxed.

Table 2 presents some of the findings from the paper. For both total average hours and minimum wage recipients, the results show a stronger effect for married women, where the effect is found to be positive in all scenarios. For single women the effect is smaller, yet also positive for all scenarios.

The table also shows that married women with prior net wages below the minimum wage are expected to increase their labour supply by 28.38 per cent, while single females increase their labour supply by 13.03 per cent. The response from married and single males is weaker, at around seven per cent.

Results derived at the aggregate level for total average hours worked suggests that the policy has a relatively small effect on total labour supply, with total average hours worked of all individuals increasing by 1.51 per cent. In this instance, the average rise in labour supply of married women in the low wage sector is about 3.42 per cent in total hours and around 1.45 per cent for single females.

Among individuals who are not in receipt of the minimum wage subsidy, results find that married non-recipients slightly decrease their working hours on average, which suggests that as a result of the increase in the net wages of their spouses, these individuals may opt to work more hours in home production due to the introduction of the minimum wage subsidy. When the government finances the wage subsidy through additional labour income taxation, the effects are predicted to be weaker. However, for the subgroup of minimum wage recipients, the effects between lump-sum and tax financing are similar.

¹⁸ A minimum wage financed by a lump-sum does not affect the hourly wage of any individual except for the minimum wage recipients. Under the tax-financed strategy, the minimum wage is financed through additional labour income tax.

As the minimum wage increases for the different scenarios, the labour supply response is predicted to decrease due to compositional changes. This is because as the minimum wage becomes higher, more workers receive this wage and these workers react more weakly to the introduction of the minimum wage than those who were previously on lower wages.

Table 2: Bredemeier and Juessen (2012)—percentage change in hours worked

Net	6.00 euros		7.25 euros		8.5 euros		Different net levels	
Gross (approx.)	7.5 euros		9.5 euros		11.85 euros		9.5 euros	
	Lump-sum	Tax	Lump-sum	Tax	Lump-sum	Tax	Lump-sum	Tax
MW recipients	16.97	17.54	13.42	14.49	12.10	12.83	12.53	10.95
Married men	7.02	7.18	4.91	5.16	4.04	4.20	5.27	4.18
Married women	28.38	28.96	23.40	24.99	21.29	22.52	24.09	20.28
Single men	6.81	6.98	5.56	5.66	5.49	5.61	5.51	5.43
Single women	13.03	13.27	9.11	9.28	8.06	7.98	9.16	9.12
Non-MW recipients	-0.12	-0.27	-0.23	-0.31	-0.37	-0.01	-0.09	-0.05
Married men	-0.15	-0.22	-0.29	-0.42	-0.44	-0.86	-0.13	-0.25
Married women	-0.21	-0.44	-0.37	-0.69	-0.64	-0.31	-0.13	0.01
Single men	0.00	-0.12	0.00	-0.23	0.00	-0.34	0.00	-0.11
Single women	0.00	-0.22	0.00	-0.22	0.00	-0.11	0.00	-0.16
Total	1.51	1.36	2.45	2.17	3.55	3.12	1.75	1.52
Married men	0.27	0.17	0.37	0.14	0.51	0.02	0.32	0.17
Married women	3.42	3.23	5.79	5.53	8.41	8.28	3.63	3.32
Single men	0.76	0.63	1.15	0.84	1.66	1.09	1.10	0.90
Single women	1.45	1.23	2.13	1.67	3.08	2.30	2.09	1.78

Note: MW = minimum wage. Different net levels refer to the fourth experiment, which takes into account the tax/transfer system as well as wages. The percentage change is relative to the baseline model.

Source: Bredemeier and Juessen (2012), Table 4, p. 21.

3.2 Young people

The papers in this Section examine responses to an increase in minimum wages in the labour market, with a particular focus on teenagers.

3.2.1 Giuliano (2013)

This paper examines the employment and wage effects of an increase in the US federal minimum wage in 1996 on adults and teenagers employed in a large firm. Although it is a firm level study, the retail firm examined comprises 700 stores across the US and the data is able to account for the change in the firm's workforce as well as for different groups of workers within the firm. While the focus is on employment and wage effects, Giuliano also indirectly examines the labour supply responses of adults and teenagers to an increase in the minimum wage. Therefore, there is no estimate of the labour supply elasticity. While each store belongs to the same firm, differences can occur due to differences in state laws, which may increase minimum wages independently of the federal minimum wage. Giuliano finds that positive effects on labour force participation were found when the minimum wage was only moderately binding.

The data set contains personnel records data from 1 February 1996 through to 31 July 1998. The personnel records include data on wage, employment status, age, race, gender, store of employment, residential ZIP code and the date and description of each personnel action. It is estimated that around 90 per cent of employees work at the same entry-level position and perform the same tasks. Turnover is relatively high, with a median spell for the position identified to be 91 days. Giuliano notes that to attract and retain qualified employees, managers are able to adjust wage offers as they see fit, based on their wages budget.

In contrast to household survey data and firm level data that does not provide information on employees, the personnel data obtained allows Giuliano to measure changes in wages and employment for the firm's workforce as well as for different groups of workers within the firm: adults, teenagers and part-time workers.

The changes in employment and wages are calculated by comparing the first six months of the sample period with the last six months. The first six months of the sample period occur before the first minimum wage increase in October 1996, and the last six months are within 12 months of the second minimum wage increase in September 1997.

The analysis is performed by using a regression that has the change in the wage or employment outcome for the store as the dependent variable. The explanatory variables consist of a set of characteristics for the store and a wage variable that measures the average or relative wage gap of the store. The wage gap is defined as the average proportional increase necessary to bring wages in line with the new minimum. Giuliano notes that the limitations of this regression specification is that the wage gap is assumed to be uncorrelated with any unobserved determinants of wages and employment, and that it does not take into account the timing of each store's adjustment to the minimum wage increases. Giuliano addresses this issue by plotting wage gap coefficient estimates from monthly regressions of store average wages, while controlling for all fixed firm-level variables.¹⁹ The increase in the minimum wage is found to have increased teenage wages more than adult wages. While an increase in the adult wage gap had a significant negative effect on

¹⁹ Giuliano finds that the wage gap coefficient is not correlated with pre-existing trends in employment and the assumption that the wage gap is uncorrelated with the error term is correct.

overall employment, the overall employment effect was less negative where the wage gap was larger for teenagers than for adults. However, the employment effect was found to be positive in markets where only the teenage wage was affected.

Giuliano examines whether this teenage employment effect was driven by labour market entry (an increase in labour supply) by analysing employment flows. Results find that the increase in the minimum wage had a positive effect on the teenage share of new hires. Teenagers exiting employment to return to school was negative and marginally significant. The positive effect on teenage employment was in part due to increases in the labour force participation of teenagers, particularly from younger teenagers and those from 'high-income' areas. Around two-thirds of the increase in the share of teenage employment was due to an increase in 16 and 17 year old employees. The increase in the teenage share of employment was higher for stores where the teenage wage relative to the adult wage increased the most.

To identify high-income areas, the study uses residential ZIP codes to rank the socio-economic status of households. High-income areas are ZIP codes ranked in the highest quartile, and low-income areas reflect those in the lowest quartile. Giuliano notes that teenagers from high-income areas are likely to have a lower marginal utility of income and higher opportunity costs of employment. To support this, Giuliano finds that teenagers from high-income areas are more likely to exit employment for school, suggesting that they have a relatively high opportunity cost of employment.

Those from high-income areas were found to comprise a disproportionate share of new teenagers being employed by the firm. However, it was found that these new workers did not displace those from lower income areas; instead young adults (20–22 years) were the most likely group to be displaced.

The results suggest that the minimum wage increase led to more teenagers entering the labour market, shown by an increase in the teenage share of new hires (Table 3) and the reduced rate at which teenagers returned to school.

Table 3: Giuliano (2013)—estimates

	Model 1	Model 2	Model 3
Change in per cent of new hires who are teenagers, Feb–Jul 1996 to Feb–Jul 1998	0.50	0.99*	0.51

Note: The figures are not elasticities and are regression coefficients of the store relative wage gap in models for the change in the per cent of new hires who are teenagers. Each model reflects different controls used and different sample sizes.
*Significant at the five per cent level.

Source: Giuliano (2013), Table 7, p. 185.

3.2.2 Ahn, Arcidiacono and Wessels (2006)

In an analysis of US teenagers, Ahn, Arcidiacono and Wessels (2006) show that an increase in the minimum wage may increase the number of people searching for work, and therefore lead to a greater chance of matches.²⁰ In this way, employment levels may increase after a rise in the

²⁰ Matches are when individuals find employment/firms hire individuals.

minimum wage. They consider that while the probability of matching may increase for a firm, the probability for an individual may decrease as there are more job seekers. The new job-seekers may therefore reduce the probability of those who originally wanted a minimum wage job to find employment. Hence, the welfare implications of an increase in the minimum wage are that those who were most interested in being employed at the minimum wage are not, while those who would normally not be interested or only marginally interested become employed.

The study uses a two-sided search model to show that changes in the overall employment level from an increase in the minimum wage does not explain movements in labour supply and labour demand. In the model, the direction of growth of employment is jointly determined by the elasticities of labour supply and labour demand which move in opposite directions. Both elasticities depend on the number of firms and number of searching workers, which are endogenous.²¹ Positive employment effects are more likely when employment depends more on labour supply than demand. If the worker has low bargaining power and low expected wages, an increase in the minimum wage may raise expected wages and thus induce job search, which may lead to job creation. In the model, the number of people searching for work has no effect on the number of matches. The model can therefore produce positive and negative employment effects, as an increase in the minimum wage will pull both forces in the opposite direction. Hence, the effect of a minimum wage increase may appear small because the employment level, which is used to measure this effect, does not capture the churning of the labour market.

In this model, the reservation value (wage) refers to the differentiated values between leisure and education. An assumption of the model is that, regardless of the reservation wage, an individual whose preference is to search for work will accept any match. This does not mean that all firms will accept every match. All firms and individuals have the same probability of finding a match.

Ahn, Arcidiacono and Wessels (2006) test for teenagers by different socio-economic background. An increase in the probability of employment for teenagers from wealthier and more educated families induces them into the labour force and may impact on those from poorer and less educated families. These workers would have lower reservation wages than the former teenagers and would be more likely to search for minimum or low-waged work. The authors explain that individuals that come from high-income families are likely to have higher reservation wages and less likely to search for a job. These individuals may also have lower search costs, as they will be willing to trade off higher expected wages, conditional on matching, for lower probabilities of employment. In contrast, individuals with lower reservation wages and high search costs will prefer lower wages that create higher probabilities of employment.

Using the US Current Population Survey, the model uses data from 1989 to 2000 for 16–19 year old (white male) teenagers who live with their parents and attend school. Information is collected on hourly wages, whether they are searching for a job (even if they are employed) and demographic variables. The prime age male unemployment rate is also used, as it is assumed to affect the probability of employment without affecting search costs or reservation wages. Over this period there were four federal minimum wage changes and 16 states which changed their state minimum wage to be higher than the federal minimum wage. The minimum wage increased from \$3.35 to \$6.50 during the period. Individuals who report earning more than \$15 per hour are excluded from

²¹ This differs from the classical model in that the labour supply elasticity has no effect on the employment level. Individuals will search for employment if their expected wages are high relative to their reservation wages and search costs.

the sample. Also excluded are those who report earning less than the minimum wage (which, for the purpose of this study, is the minimum wage less 25 cents).²²

Minimum wage effects on the probability of search, the probability of obtaining employment conditional on search, and the unconditional probability of employment are derived as elasticities. Although the employment elasticity is found to be close to zero for this group, the paper notes that this is covering changes in the supply and demand of this group, such as an increase in searching for a job and a decrease in the probability of finding a job (conditional on search).

The authors show that, even if employment increases, an increase in the minimum wage will always lower the probability of an individual finding a minimum wage job. However, the effect on employment is ambiguous and positive employment effects are possible. These become more likely when employment is dependent on the labour supply elasticity more than the labour demand elasticity.

The results show that a minimum wage increase raises the probability of searching for work and therefore labour force participation for these teenagers. While the overall employment elasticity is relatively small, this is due to the competing search and matching elasticities. The search elasticity was found to be 0.21 and the matching elasticity (the probability of employment conditional on search changes) –0.23 (Table 4). The study also finds that those whose probabilities of finding work increase were less likely to search for work before the minimum wage increase.

The paper finds that teenagers who have a household head with a higher level of education are more likely to respond to an increase in the minimum wage by participating in the labour force because they are less likely to have been searching for a job before the minimum wage increase and therefore risk a higher expected wage given a lower probability of employment. An increase in the employment probability was found in over 90 per cent of teenagers whose household head had completed more than four years of study after high school.

A teenager's reservation wage was found to increase and search costs decrease as the educational attainment level of the parent increases. The effect was higher for search costs.

Table 4: Ahn, Arcidiacono and Wessels (2006)—elasticities

Group	Search elasticity	Match elasticity
All teenagers	0.2135	–0.2267
Household head high school or less	0.1880	–0.2357
Household head some college	0.2080	–0.2237
Household head four-year college	0.2439	–0.2146
Household head post four-year college	0.2806	–0.2162

Note: The search elasticity is the probability of looking for a job and the match elasticity is the probability of employment conditional on search.

Source: Ahn, Arcidiacono and Wessels (2006), Table 8, p. 29.

²² These refer to nominal wages.

3.2.3 Wessels (2001)

Wessels models the impact of a series of minimum wage increases in the US on the labour force participation rate of teenagers who are earning the minimum wage or less. Wessels believes that the main effect of the minimum wage is through the demand side.

Wessels argues that the supply side effects would be relatively small following a minimum wage increase. For example, an increase in the minimum wage would reduce labour supply mainly through an increase in income for another family member, although it is stated that the minimum wage has little overall effect on family income. The minimum wage increase may also increase the value of future work opportunities, however, the minimum wage is likely to affect teenagers for only a small amount of their working lives.

Wessels explains that if the minimum wage has a relatively small effect on the supply of teenage labour force participants then the main effect will be on its demand for labour force participants. Wessels argues that the demand for labour force participants (based on an employer's wage offers and hiring activity) determines the value of being in the labour market. This value includes lifetime utility which incorporates the expected cost of searching for a job and the future higher earnings from greater job experience. The model assumes that if an increase in the minimum wage decreases the labour force participation rate, the increase is likely to decrease the value of being in the labour market and searching for work. An individual enters the labour force if their income from being in the labour force is greater than their implicit income of not working. For teenagers, the value of not working would include being in school.

Wessels remarks on the difference between 'demand for labour force participants' and 'demand for workers by employers', by explaining that while an increase in the minimum wage may decrease employment, it will increase the demand for labour force participation by making being in the labour force more attractive.

The increase in the minimum wage leads to changes in wages, employment and the probability of getting a job as there are more individuals competing for the same number of jobs. As the labour supply curve is assumed to not shift significantly, these changes result in the labour demand curve shifting down, reducing the value of being in the labour market.

By examining three sets of minimum wage increases in the US, the study considers the impact during different points in the economic cycle, representing minimum wage increases in 1978,²³ 1990 and 1996. As most minimum wage increases in the US come in 'sets', the analysis for 1978 covers the sum of increases that occurred between 1978–1981; for 1990 it covers the sum of increases between 1990–1991; and for 1996 it covers the sum of increases for the period between 1996–1997. Wessels explains that for the 1990 and 1996 increases, the second step was more binding than the first.

Regressions were run on the norms of the labour force participation rate. To control for the business cycle, the model uses lagged values of the dependent variable and other explanatory variables related to the business cycle, such as the male unemployment rate. The unemployment rate of white males between 30 and 54 years old was chosen because it was not significantly

²³ Wessels notes that since the sample begins in 1979, the minimum wage increase in 1979 is combined with the minimum wage increase in 1978.

related to the minimum wage variable and the minimum wage variable should be exogenous from explanatory variables used in the regression.

Wessels uses the US Current Population Survey data and studies the period between 1979 and 1999 to obtain the proportion of employed teenagers (15–19 years) who are earning the minimum wage or less. The minimum wage variables used in the analysis are the summed increases in the minimum wage over each of the three periods, weighted by the fraction of teenagers receiving the minimum wage. Wessels considers this to be a more objective measure of the minimum wage coverage and the extent to which the minimum wage affects the job market.

Table 5 presents the results from Wessels which show that the three sets of increases in the minimum wage had a negative impact on the labour supply of teenagers. Wessels also looks at the impacts on other age groups and on those with different educational attainment levels. He finds that a minimum wage increase for the next age group, young adults aged between 20 and 24 years had no significant impact. For high school graduates aged 18–24 years, the impact was found to be negative, and for high school dropouts of the same age group the impact was found to be positive. However, Wessels notes that these results may have been affected by a relatively low sample size for dropouts.

Table 5: Wessels (2001)—effect on the labour force participation rate of teenagers with respect to minimum wage, by different groups

Set of increases	1978–1981	1990–1991	1996–1997
All teenagers	−0.167***	−0.162***	−0.138**
15–17 years	−0.310***	−0.195***	−0.184*
18–19 years	−0.020	−0.090**	−0.059***
20–24 years (Young adults)	0.031	−0.014	0.046
High school dropouts 18–24	0.074	−0.098**	0.099
High school graduates 18–24	−0.044*	−0.015	−0.028
Males	−0.120*	−0.172***	−0.222**
Females	−0.275***	−0.191***	−0.051

Note: Significant at the *** one per cent level; ** five per cent level; * ten per cent level.

Source: Wessels (2001), Table 9, p. 17.

While Wessels' results indicate that the minimum wage decreases labour force participation, he argues that this finding may not be solely due to its effect on employment. He suggests that the increase could also have a negative impact on firm non-wage compensation, as well as job turnover, which increase the cost of searching for a job. In effect, Wessels contends that the decline in labour force participation reflects the minimum wage reducing the value of being in the labour force for most workers.

3.2.4 Schaafsma and Walsh (1983)

This paper estimates the effect of minimum wages on labour supply and employment for three age groups and by gender using Canadian provincial data for the period between 1975 and 1979. The age groups are adults (25+ year olds), young adults (20–24 year olds) and teenagers (15–19 year olds).

Schaafsma and Walsh note that for each group there are three endogenous variables: the number of people willing to work (the labour force); the number of people already in employment (employment); and the wage rate for that group. However, the model does not contain wage data and therefore cannot identify labour demand or separate these effects from labour supply. As a result, reduced form equations for employment and the labour force are estimated separately.

Equations are specified for employment and the size of the labour force and the response of these variables to changes in the minimum wage are estimated. The labour force participation level is used rather than the labour force participation rate (tests found no significant differences between rates and levels). Schaafsma and Walsh note that in contrast to other studies, their regression analysis incorporates the real minimum wage rate, instead of the product of the minimum wage and coverage,²⁴ and that their demand variation variable is represented as real output, rather than the prime-age male unemployment rate.

Observations are pooled in the model for the period between 1975 and 1979. Provincial dummy variables are included to account for differences in employment and labour force levels that are not already captured in other explanatory variables.

Based on the employment equation, Schaafsma and Walsh report estimates of the minimum wage elasticity of employment. They find that for all six groups the elasticities are negative and statistically significant for five of the six age-gender groups.²⁵

Minimum wage coefficients in the labour force equation present the minimum wage elasticity of labour supply and are displayed in Table 6. The results show that the minimum wage elasticity of labour supply is significantly negative in all the equations estimated for males, as well as the equation estimated for female teenagers. For the adult female age groups, the minimum wage has a positive but not significant effect on the labour force of adult females.

Schaafsma and Walsh highlight that teenagers are more likely to withdraw from the labour force in response to a higher minimum wage and suggest that this may be due to greater education and training opportunities that exist for this group compared with adults.

²⁴ Coverage represents the percentage of the labour force receiving the minimum wage. Data limitations concerning the labour force composition prevent construction of a more reliable coverage rate variable. Schaafsma and Walsh note that it is reasonable to assume that changes in the minimum wage rates have greater influence on labour supply (and employment) than the coverage, as increases in the real minimum wage rate affect increasingly large numbers of the population, as the real minimum wage rate increases and moves towards the mean real wage earnings. Changes in the minimum wage rate and changes in the minimum age coverage may not exert the same influence on labour force participation.

²⁵ The minimum wage elasticity for the females 25+ group was not found to be significant.

Table 6: Schaafsma and Walsh (1983)—minimum wage elasticity of labour supply, estimates of the minimum wage coefficient

Group	Minimum wage elasticity of labour supply
Males 15–19 years	–0.361***
Males 20–24 years	–0.125**
Males 25+ years	–0.091***
Females 15–19 years	–0.444***
Females 20–24 years	0.027
Females 25+ years	0.004

Note: Significant at the *** one per cent level; ** five per cent level.

Source: Schaafsma and Walsh (1983), Table 1, pp. 90–91.

Schaafsma and Walsh also test the minimum wage elasticity of the employment to labour force ratio and, indirectly, the unemployment rate. The estimates find a negative elasticity for the employment to labour force ratio and a positive elasticity for the unemployment rate for all groups.

3.3 Summary of studies

Most studies outlined in this review find that the overall effect of an increase in minimum wages on labour supply is relatively small. However, when the sample is restricted to individuals affected by the increase in the minimum wage, the effects are greater.

Only one study measures the labour supply response of a minimum wage increase in Australia. Using a microsimulation model, Buddelmeyer and Kalb (2008) find a positive response for minimum wage workers and for all employed after the 2008 FMW increase, with a larger response for minimum wage workers. Focusing on population subgroups, Buddelmeyer and Kalb find that the responses of married women and single parents were relatively high. Bredemeier and Juessen (2012) find greater responses from married women than single women. The evidence on teenagers is mixed. Ahn, Arcidiacono and Wessels (2006) and Giuliano (2013) report positive effects, other studies find a decline in the labour supply of teenagers in response to a minimum wage increase. Studies cite the response of teenagers to reflect greater education and training opportunities or conversely other labour demand effects that have increased the cost of searching for work.

The limited number of papers reviewed suggests that no definitive conclusion can be drawn from this review. Most papers use different data sources, cover different time periods and reflect a range of differing institutional factors across the countries examined.

However, since women are more likely to be award-reliant and since the literature has shown that women, in particular married women, have a greater labour supply elasticity than men, the findings suggest that Australian women are more likely to respond to an increase in minimum wages.

While microsimulation models have been used to estimate labour supply responses to policy changes related to the tax/transfer system, there is little work on the behaviour of labour supply in response to increases in minimum wages.

4 Conclusion

When modelling labour supply behaviour, the standard approach is to use a model where individuals choose the amount of work and leisure that maximises their utility based on a budget constraint. Labour supply may increase or decrease, depending on the relative strengths of the income and substitution effects.

The review finds that there are many factors that can affect the labour supply decision. They include individual or household characteristics, financial and non-financial benefits, as well as their perceived chances of obtaining work.

Some population subgroups have been found to be more responsive to wage changes, such as females (particularly partnered females), and these subgroups are also more likely to be award-reliant and therefore more likely to respond to minimum wage changes.

While the literature on labour supply is quite extensive, this review has found relatively few research papers on the labour supply responses to increases in minimum wages both in Australia and internationally. Findings from empirical studies reviewed were ambiguous and varied in their methodology.

As Bredemeier and Juessen (2012) acknowledge, studies mainly focus on the labour demand effects of an increase in minimum wages. Therefore, more research is needed to better understand the supply side effects of an increase in minimum wages, as a review of the literature has shown that the effects are quite different for particular segments of the population. Perhaps future research should involve updated modelling of the impact of increases in minimum wages for different population subgroups in an Australian context.

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