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### Wage Subsidies in a Program for Economic Inclusion and Growth

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# **Wage Subsidies in a Program for Economic Inclusion and Growth**

**Hian Teck Hoon**

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# Wage Subsidies in a Program for Economic Inclusion and Growth\*

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February 2011

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## **Abstract**

This paper is in three parts. The first part discusses the workings of a wage subsidy scheme in boosting employment and earnings of workers. The second part reviews the empirical evidence on the effectiveness of wage subsidy schemes in countries that have implemented them both as countercyclical policies as well as structural programs to boost long-term earnings and employment of low wage workers. The third part looks at Singapore as a case study of how wage subsidies have been used in a program for generating economic inclusion both in the context of growth as well as in the context of business fluctuations.

## **1 Introduction**

At the heart of a meaningful life is the holding of a steady job. Holding a job on a regular basis not only provides a steady source of income that is needed to provide for one's lifetime consumption and that of dependants. This is the pecuniary reward from work. In addition, there are non-pecuniary rewards from work. The workplace provides a continuing stream of problems that need to be solved, which stretches one's capacity for problem solving. One learns to set goals and work assiduously to achieve them. In the process, one discovers the joy of growing intellectually. Even if a job seems mundane, the very habit of going to work regularly and delivering an honest day's work for the pay one receives enhances self respect. Attributes like being punctual and keeping at a problem until it is solved are all learned at the workplace. At work, one also meets interesting colleagues who provide the social interactions that we all need to be fully functioning human beings.

When the level of joblessness is high, and especially when the duration of unemployment is also high, many people not only lose their regular source of income. Research shows that the costs of prolonged unemployment not only include the direct loss of incomes but also deep emotional and psychological scars. As efforts to look for a regular job end up in failure, deep discouragement and pessimism set in. This, in turn, affects the quality of relationships that the jobless person has with others. Moreover, prolonged unemployment results in an erosion of skills.

The cost of joblessness is not only borne by the jobless individual himself or herself. There are also negative spillovers on the rest of society. One channel is fiscal. When many members of a society are unemployed, there is the obvious loss of a potential tax base to generate government revenue to fund programs in education and public goods that benefit the rest of society. There is the possibility of multiple equilibria working through a fiscal channel. A society with a low unemployment rate has more members paying taxes that fund public education and high quality infrastructure that support a highly productive economy capable of delivering jobs with good pay. On the other hand, there also exists an equilibrium with high unemployment where the marginal tax rates on the remaining tax paying agents are so high that it leads to a shrinkage of the productive sector and thus fewer good jobs.

Another channel works through expectations. When businesses decide whether to undertake major investments in new initiatives, they look both at whether there will be demand for the new products they launch as well as at whether they can find a creative workforce to design and experiment with the new products. When a significant share of the labor force has been

without work for a long time, the domestic market would not have the critical mass of venturesome consumers who have the financial means and aptitude to try out the new products.<sup>1</sup> When there is a high incidence of long term unemployment, the prospective firms also expect that it would be difficult to find the job-ready workers who know the market well enough to try out and experiment with new products. As a result, few firms set up in such an economy or few existing firms make investments to try out new products thus depriving the economy of new productive jobs.

There exists the hope of jump-starting an economy caught in a high unemployment trap so that a process is started that moves it to an alternative equilibrium that exhibits low unemployment and better pay. This paper discusses the part that can be played by a wage subsidy scheme in an overall program to generate growth and economic inclusion. This agenda item is of particular significance for South Africa. In the *OECD Economic Surveys: South Africa, July 2010*, it was argued that even before the external recessionary shock associated with the credit crisis from late 2008 hit the economy, the unemployment rate averaged 20 percent. Among young people, the unemployment rate was even higher. The external shock raised the average unemployment rate to 25 percent with a higher incidence among young people. It would be helpful to discuss wage subsidy schemes in the context both of saving jobs in the face of a collapse of aggregate demand as well as in the context of a structural policy to boost the employment and earnings of

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<sup>1</sup>See the argument for the importance of having a sufficiently large base of venturesome consumers for a fully functioning dynamic economy in the work of Amar Bhidé. In particular, see his 2008 book, *The Venturesome Economy: How Innovation Sustains Prosperity in a More Connected World*, Princeton: Princeton University Press.

workers at the bottom end of the income distribution.

The remaining paper is organized as follows. Section 2 discusses the workings of a wage subsidy scheme in boosting employment and earnings of workers. Section 3 reviews the empirical evidence on the effectiveness of wage subsidy schemes in countries that have implemented them both as countercyclical policies as well as structural programs to boost long-term earnings and employment of low wage workers. Section 4 looks at Singapore as a case study of how wage subsidies have been used in a program for generating economic inclusion both in the context of growth as well as in the context of business fluctuations. Section 5 concludes.

## 2 Workings of a Wage Subsidy Scheme

At the simplest level, the aim of a wage subsidy scheme is to boost the employment and the take-home earnings of workers, particularly low wage workers. A wage subsidy (sometimes also called an employment subsidy) can be given directly either to a firm or to a worker. When given directly to the firm, it reduces the firm's marginal factor cost, that is, with the subsidy, the addition to total cost from employing one more worker is reduced by the amount of the subsidy. When given directly to a worker, a condition is that the qualifying worker must be employed. Thus, a wage subsidy is unlike a welfare entitlement as the latter is given *regardless* of the employment status.<sup>2</sup>

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<sup>2</sup>Milton Friedman's proposal of a negative income tax is *not* an example of a wage subsidy since a person with zero income would still receive the grant under his proposal. See Milton Friedman, 1962, *Capitalism and Freedom*, Chicago: University of Chicago Press. Since the grant received is not tied to employment in Friedman's proposal, it lacks

A wage subsidy given directly to a worker is essentially a workfare income supplement as it supplements the salary that the employer pays.<sup>3</sup>

But how does the granting of a wage subsidy work to boost employment and take-home pay of low wage workers? There are two main premises of the analysis: (i) Workers and firms respond to financial incentives; and (ii) A 

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the feature of creating incentives for the recipient of the grant to hold on to a job. If, as we argued in the Introduction, work has many non-pecuniary rewards, we would want to use limited fiscal resources to not only augment the spending power of those in the bottom of the income distribution but also strengthen their attachment to the workplace.

<sup>3</sup>The U.S. Earned Income Tax Credit (EITC) program is an example of a workfare income supplement scheme. Singapore has implemented two different schemes. Its Workfare Income Supplement (WIS) scheme gives the wage subsidy directly to the worker and was implemented in 2007. After a review of the scheme to ascertain its effectiveness in boosting employment and pay, the scheme was further expanded to include more qualifying people in 2010. The WIS program is meant to be a structural policy aimed at boosting the take-home pay and employment of low wage workers as the Singapore economy faced the effects of a secular shift in demand away from low wage workers arising from shifts in comparative advantage and skill-biased technological change. At the beginning of 2009, in the face of the fallout from the credit crisis that led to a sharp fall in aggregate demand, Singapore introduced a Jobs Credit scheme where the subsidy was given directly to firms. The Jobs Credit scheme was a countercyclical policy aimed to save jobs and ended in July 2010 when the Singapore economy made a strong recovery in the first two quarters of 2010. In previous decades, such as during the sharp and deep recession in 1985-86 and the Asian financial crisis of 1997-98, a major plank of a counter-recessionary policy included wage subsidies given directly to firms that were effected through cuts in employers' Central Provident Fund (CPF) contributions. (The CPF is Singapore's defined contribution social security system. For each worker on a firm's payroll, both the employee and the employer make a monthly contribution that goes into the retirement fund of the worker.) These CPF cuts were gradually restored when the economy recovered from the recessions.



new equilibrium in the labor market is reached after workers and employers have responded to the wage subsidy. When the wage subsidy is given directly to the firm, there is a boost to labor demand at any given wage so the labor demand curve shifts out; when given directly to the worker, there is a greater incentive to work so there is a shift of the labor supply curve in a neoclassical model of the labor market. In the case of an efficiency wage model or a search and matching model of the labor market, the neoclassical labor supply curve is replaced by a wage curve. Once a curve has shifted in the labor market diagram in response to the granting of a wage subsidy, the economy generally achieves equilibrium at a new employment level and a new wage rate. Our prior expectations are that the new post-subsidy equilibrium should coincide with higher employment and higher take-home pay. To see how that outcome is achieved, however, we need to draw upon what we can learn from labor economics.

It will help us organize our discussion by considering how a wage subsidy works to boost employment and pay, first, in a neoclassical model of the labor market, second, in an efficiency wage labor market, and, third, in a search and matching model of the labor market.<sup>4</sup>

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<sup>4</sup>The 2010 Nobel prize for Economic Sciences was awarded to Professors Peter Diamond, Dale Mortensen, and Christopher Pissarides for their work in developing the search and matching model of the labor market. In contrast to the frictionless neoclassical labor market, the search and matching model emphasizes the fact that there is a lot of heterogeneity in the types of jobs and that there are frictions that prevent a firm from instantaneously finding a suitable worker with the right skills and aptitude for the job and that prevent a worker from finding his or her ideal job immediately. Thus job vacancies and unemployment can coexist. The 2006 Nobel prize winner, Professor Edmund Phelps, in his seminal paper introducing the expectations-augmented-Phillips curve to study in-

## 2.1 Neoclassical model of labor market

The neoclassical model of the labor market is the right place to start our analysis even if it is not the place to end if we are interested in *unemployment*, particularly, involuntary unemployment where there exist people who would like to get a job at the prevailing wage but who cannot succeed in getting one. The neoclassical model helps us to develop our intuition about how a wage subsidy works in a market setting to boost employment and pay.

There are two sides of the labor market represented by the labor demand curve and the labor supply curve, respectively. Let us first study how a wage subsidy given directly to a firm affects the firm's labor demand decision. To grasp the firm's employment decision, we study the firm's behavior in a competitive market. The firm is assumed to maximize its profit by choosing the optimal number of workers to employ given the production function relating the firm's output,  $Y$ , to its factor inputs given the level of technology. Suppose that there is a given capital stock,  $\bar{K}$ , that the firm's workers use

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flation and unemployment, also introduced one of the first examples of an efficiency wage labor market. The idea is that an employee's effort on the job and his or her propensity to quit are both directly affected by the wage paid by the firm relative to the wage that the worker can expect to earn elsewhere in the economy. As a result, a firm may save cost directly by lowering its own wage rate but, indirectly, that unilateral wage cut acts to *raise* unit cost of production because either workers' effort declines in response or more workers quit. Since it costs something for the firm to train new employees, the need to replace those who quit end up raising business cost. Thus there is a limit to how far the wage rate can fall, and at the efficiency wage rate chosen by firms, involuntary unemployment generally exists. (See Edmund Phelps, 1968, "Money-Wage Dynamics and Labor-Market Equilibrium," *Journal of Political Economy*, 76(4, Part 2):678-711.)

to produce the output given the level of technology represented by an index  $A$ . Letting  $N$  represent employment, the production function can be represented by  $Y = AF(\bar{K}, N)$ . Let  $w^f$  be the real wage rate, that is, the wage rate after adjusting for inflation, per unit of labor paid by the firm. Then the take-home pay per unit of labor received by the worker can be written as  $w^h \equiv (1 + s^w)w^f$ , where  $s^w$  is the subsidy rate. Thus a value of  $s^w = 0.1$  means a 10 percent subsidy rate. The firm's maximization problem can be written as

$$\text{Maximize } AF(\bar{K}, N) - \left( \frac{w^h}{1 + s^w} \right) N$$

by choosing  $N$ . The first-order condition from the optimal choice of employment is

$$AF_N(\bar{K}, N) = \frac{w^h}{1 + s^w}, \quad (1)$$

where  $AF_N(\bar{K}, N)$  is the value marginal product of labor in real terms and the righthand side term in equation (1) is the marginal factor cost. Under the usual assumption of diminishing marginal product of labor, that is,  $AF_{NN}(\bar{K}, N) < 0$ , we get the result that, at a given real wage received by the worker, an increase in the wage subsidy rate, say from zero to 10 percent, results in an increase in optimal employment,  $N^d$ . In the usual labor market diagram, there is a rightward shift of the labor demand curve. We get a useful result:

**Result 1:** *An increase in the wage subsidy rate given directly to the firm shifts out the firm's labor demand curve.*

We now turn to the determination of labor supply. Economists speak about labor supply behavior at both the *intensive* and *extensive* margins.

At the intensive margin, we would like to know how higher take-home pay leads someone who is already employed to work more hours or weeks. At the extensive margin, we would like to know how higher take-home pay affects the number of people who were previously not working to start working.

Let us begin with labor supply at the intensive margin. How does an individual who is already employed decide whether to work more or less hours or weeks? We introduce the notion of a utility function that relates an individual's index of felicity to his or her consumption level and amount of leisure. Each individual has a given time endowment (like 52 weeks in a year) that can be allocated to work or leisure. Letting  $\bar{L}$  be the time endowment,  $C$  be the level of consumption,  $L$  the amount of leisure, and representing the individual's utility function by  $U(C, L)$ , the individual's maximization problem can be written as

$$\begin{aligned} &\text{Maximize } U(C, L) \\ &\text{subject to} \\ &C = w^h(\bar{L} - L) + B, \end{aligned}$$

where  $B$  is nonwage income, by choosing consumption and labor supply.

Does a worker, who is currently employed, work more or less hours when his or her take-home wage rate,  $w^h$ , increases? There are two effects. Because the reward to work is greater when the take-home pay is increased, the worker is induced to forgo leisure and supply more hours. This is the *substitution* effect of a higher take-home pay. However, a higher take-home pay also makes the individual feel richer, which encourages him or her to take more leisure and thus supply less labor. This is the *income* effect of higher pay. If

the substitution effect is stronger than the income effect, the result is that a higher take-home pay encourages increased number of hours or weeks worked. This leads to an upward-sloping labor supply curve, where labor supply,  $N^s$ , is equal to time endowment minus leisure.

Next, let us turn to labor supply behavior at the extensive margin. In this model, we assume that a job requires a worker to work a fixed number of hours.<sup>5</sup> An economically active individual then only has to decide whether to work or not to work. However, the economically active population of individuals have different levels of disutility from work that can be summarized by a cumulative distribution function,  $H(m)$ , where  $m$  is a measure of the disutility level from work. There is a cutoff disutility level, denoted  $m^*$ , that can be solved such that individuals in the distribution whose disutility levels lie below  $m^*$  will voluntarily choose to work and those whose disutility levels lie above  $m^*$  will choose to be out of the labor force. What an increase in the take-home pay does is to raise the cutoff disutility level,  $m^*$ , so that, at the extensive margin, labor supply increases, that is, more people choose to work.

To demonstrate how an increase in the take-home pay leads more economically active individuals to choose to work, we proceed as follows. For simplicity, we assume that the disutility level from work is uniformly distributed between  $\underline{m}$  and  $\bar{m}$ . An individual has the following utility function:  $\log C + \log(\bar{L} - m\bar{l})$ , where  $C$  is consumption,  $\bar{L}$  is a constant, and  $\bar{l}$  is the fixed number of hours worked. For convenience, we set  $\bar{l} = 1$ . When an

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<sup>5</sup>See Peter Diamond, 1980, "Income Taxation with Fixed Hours of Work," *Journal of Public Economics*, Vol. 13, 101-110.

individual is economically inactive, his or her consumption is equal to  $B$ , the nonwage income. Such an economically inactive person's utility function can be written as  $\log B + \log \bar{L}$ . When the individual chooses to work, he or she earns a take-home wage of  $w^h$ . Since consumption is now equal to  $w^h + B$ , we can write the utility function for the worker as  $\log[w^h + B] + \log(\bar{L} - m)$ . It is then straightforward to see that the cutoff disutility level from work,  $m^*$ , is obtained when the individual is indifferent between working and not working, that is, it is the solution to the following equation:

$$\log[w^h + B] + \log(\bar{L} - m^*) = \log B + \log \bar{L}.$$

It is readily shown (see footnote) that  $m^*$  is increasing in  $w^h$  so that a higher take-home pay leads to an increase in labor supply at the extensive margin.<sup>6</sup> The neoclassical model of labor supply at the extensive margin, therefore, predicts that the labor supply curve is positively sloped.

We have all the ingredients now to have our basic model to illustrate how a wage subsidy given to the firm acts to boost employment and take-home pay of workers. When firms are given a wage subsidy, **Result 1** tells us that the labor demand curve shifts out. Consequently, at the original equilibrium wage, there is an excess demand for labor. The increased competition by firms for workers arising from the wage subsidy serves to bid up the market price of labor, which is the take-home pay of workers. Thus, our second important result is as follows:

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<sup>6</sup>We note that we can rewrite the equation as  $\log \left[ \frac{w^h + B}{B} \right] = \log \left[ \frac{\bar{L}}{\bar{L} - m^*} \right]$ , from which, after simplification, we obtain  $m^* = \left[ \frac{w^h}{w^h + B} \right] \bar{L}$ . With  $B > 0$ , an increase in  $w^h$  increases  $m^*$ .

**Result 2:** *A wage subsidy given directly to firms results in increased competition by firms for workers. As a result, the take-home pay of workers is pushed up and employment is increased.*

We now have a view of how a wage subsidy given directly to firms works to boost employment and earnings of low wage workers. But we may ask what factors determine the *quantitative* magnitude of the effects on employment and take-home pay of workers. Suppose that the wage subsidy rate is 10 percent. By how much will employment rise? And by how much will the take-home pay of workers rise? Economists provide an answer to these two important questions by expressing the percentage change in employment and percentage change in take-home pay in response to, say, a 10 percent subsidy rate in terms of the elasticities of labor demand and labor supply.<sup>7</sup>

Let labor supply be represented by  $N^s = N^s(w^h)$  and labor demand be represented by  $N^d = N^d(w^f)$ . In labor-market equilibrium, labor demand equals labor supply so

$$N^d(w^f) = N^s(w^h). \quad (2)$$

Taking derivatives through equation (2), and noting that  $w^f \equiv w^h/(1 + s^w)$ , we can show that

$$\frac{d \log w^h}{ds^w} = \frac{\eta}{\eta + \epsilon}, \quad (3)$$

where  $\epsilon$  is the wage elasticity of labor supply and  $\eta$  is the wage elasticity of labor demand. Further using the inverse labor demand curve and the inverse

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<sup>7</sup>Formally, the elasticity of labor demand is defined as the percentage change in labor demanded in response to a percentage change in the cost of labor. Correspondingly, the elasticity of labor supply is defined as the percentage change in labor supplied in response to a percentage change in the take-home wage rate.

labor supply curve, we can then show that

$$\frac{d \log N}{ds^w} = \frac{\eta \epsilon}{\eta + \epsilon}. \quad (4)$$

Suppose that the labor supply elasticity is high ( $\epsilon$  is high), that is, a given wage increase can solicit a large increase in labor supply. According to equations (3) and (4), we draw the conclusion that the introduction of a wage subsidy has a relatively large effect on employment and a relatively small positive effect on take-home wage rate when labor supply elasticity is high. Next, suppose that the labor demand elasticity is high ( $\eta$  is high), that is, a given decline in labor cost can solicit a large increase in labor demand. Then, according to equations (3) and (4), we draw the conclusion that the introduction of a wage subsidy has a relatively large positive effect on employment *as well as* a relatively large positive effect on take-home wage rate when labor demand elasticity is high. We can summarize our findings in the following useful result:

**Result 3:** *The introduction of a wage subsidy has a relatively large positive effect on employment but a relatively small positive effect on take-home wage rate if the wage elasticity of labor supply is high. On the other hand, a wage subsidy has a relatively large positive effect on employment as well as on take-home wage rate if the wage elasticity of labor demand is high.*

The neoclassical model of the labor market with labor supply decisions made at the extensive margin (whether to work or not to work a fixed number of hours) has the tight implication that a wage subsidy given to the firm induces more people to enter the labor force and immediately find employment.



Those not working choose *voluntarily* to stay out of the labor force because it is deemed that the reward to work (the take-home pay rate) is too low to make it worth the while for these individuals to enter the job market. There is no *unemployment* and thus no job rationing in the neoclassical model of labor market. To incorporate unemployment, we need to go beyond the neoclassical model. There are two other models of the labor market where there does exist unemployment. The first is the efficiency wage model, sometimes also called the incentive-wage model; the other is the search and matching model of the labor market.

## **2.2 Efficiency wage model of labor market**

The major insight of the efficiency wage model of the labor market is that firms need to adopt a wage policy (in the simplest case, to choose a wage rate) to encourage the optimal level of effort by its workforce. In this way, the theory departs from the neoclassical model of the labor market where every firm is a price taker and only chooses the optimal number of workers to hire at the prevailing market wage rate. As workers are prone to exert less than the required effort level, unless closely supervised, the firm has an incentive to choose a wage rate to minimize wage costs per unit of effort. In such an economy, even though a firm saves direct cost by cutting wages, it has to tackle the problem of weak morale and weakened job attachment brought about by the wage cut, which indirectly raises business costs. The firm, therefore, has to decide on the wage that minimizes effective cost, and then at that efficiency wage level, decide the optimal number of workers to hire. This efficiency wage rate will typically be above market clearing so

unemployment results.

Suppose that the level of worker's effort can be represented by the function,  $e(w^h/z)$ , where  $w^h$  is the take-home pay adjusted for inflation at the particular firm the worker is employed at and  $z$  is the expected income if not employed at that firm. We write  $z \equiv (1 - u)w^h + uB$ , where  $u$  is the unemployment rate and  $B$  is income support in the event that the worker is without a job. The firm which operates in an efficiency wage labor market can be thought of as solving a two-step problem. The first step is to choose an efficiency wage to minimize effective cost, that is, wage cost per unit of effort; the next step is to choose the profit-maximizing level of employment at that chosen efficiency wage.

The condition from choosing the wage rate,  $w^f$ , to minimize the effective cost,  $w^f/e(w^h/z)$ , is given by the famous Solow elasticity condition:<sup>8</sup>

$$\left(\frac{w^h}{z}\right) \left[ \frac{e' \left(\frac{w^h}{z}\right)}{e \left(\frac{w^h}{z}\right)} \right] = 1. \quad (5)$$

The optimal choice of efficiency wage gives a value represented by  $(w^h/z)^* = \text{constant} = k$  that satisfies the Solow elasticity condition where marginal effort is equal to average effort. As an example, suppose that the effort function is given by

$$e \left( \frac{w^h}{z} \right) = \left[ \frac{w^h}{z} - \alpha \right]^\gamma ; 0 < \gamma < 1.$$

In this case,  $(w^h/z)^* = \alpha/(1 - \gamma)$  so  $k = \alpha/(1 - \gamma)$ . Suppose that the economy cannot fall below two percent without it being infinitely costly to

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<sup>8</sup>See Robert Solow, "Another Possible Source of Wage Stickiness," *Journal of Macroeconomics*, Vol. 1, Winter, pp. 79-82.

induce worker effort. The value of  $k$  that leads to this condition is  $k = 1.02$ . Implicit differentiation gives us the slope of what may be called a wage curve or a pseudo-labor supply curve, which replaces the conventional neoclassical labor supply curve:

$$\left. \frac{dw^h}{d(1-u)} \right|_{\text{slope of wage curve}} = \frac{k[w^h - B]}{1 - k(1 - u)}. \quad (6)$$

As we can see, the wage curve is positively sloped in the employment rate—output plane for unemployment rates above two percent, assuming that  $w^h > B$ . This means that as the unemployment rate declines, the efficiency wage the firm has to pay to minimize effective cost must correspondingly rise.

Given the efficiency wage represented by  $(w^h/z)^*$ , the firm chooses the optimal number of workers to employ. The firm's maximization problem can now be written as

$$\text{Maximize } AF\left(\bar{K}, e\left(\frac{w^h}{z}\right)^* N\right) - \left(\frac{w^h}{1 + s^w}\right) N$$

by choosing  $N$  where effective employment is given by effort multiplied by number of employed workers. The first-order condition from the optimal choice of employment is

$$e\left(\frac{w^h}{z}\right)^* AF_N\left(\bar{K}, e\left(\frac{w^h}{z}\right)^* N\right) = \frac{w^h}{1 + s^w}, \quad (7)$$

If this is a representative firm, and there are as many firms as there are members of the workforce, then  $N \equiv 1 - u$ . This gives a downward-sloping labor demand curve in the employment rate—output plane.

Using an efficiency wage labor market framework, we can now see that giving a wage subsidy directly to the firm has the effect of shifting out the

labor demand curve. In contrast to the neoclassical model of the labor market, however, we have the result that the increased competition for labor as a result of the wage subsidy leads to higher take-home pay as well as *reduced* unemployment. A wage subsidy in the efficiency wage model, therefore, saves jobs!

Equilibrium in the labor market here is represented by the rate of unemployment that reconciles the firm's demand wage (the wage on the labor demand curve at a given unemployment rate) to the efficiency wage (the wage on the wage curve at a given unemployment rate). If we now let  $\epsilon$  represent the elasticity of the wage curve (or pseudo-labor supply curve) and  $\eta$  represent the wage elasticity of the labor demand curve, we can express the incidence of a wage subsidy by the following two formulae:

$$\frac{d \log w^h}{ds^w} = \frac{\eta}{\eta + \epsilon}, \quad (8)$$

$$\frac{d \log(1 - u)}{ds^w} = \frac{\eta \epsilon}{\eta + \epsilon}. \quad (9)$$

To be more concrete, if we let  $(w^h/z)^* = \text{constant} = k$ , we can show that the elasticity of the wage curve, that is, the percentage change in the employment rate in response to a percentage point change in the take-home real wage,  $\epsilon$ , can be written as

$$\epsilon = \frac{1 - k(1 - u)}{k(1 - u) \left[ 1 - \left( \frac{B}{w^h} \right) \right]}. \quad (10)$$

If we let  $B/w^h = 0.5$  and the unemployment rate be 25 percent, we find that, with  $k = 1.02$ , the elasticity of the wage curve,  $\epsilon$ , is equal to 0.62; if the unemployment rate is 40 percent, then, with  $k = 1.02$ , the elasticity of the wage curve,  $\epsilon$ , is equal to 1.26. Using the result that the elasticity of the

wage curve is higher the higher the initial unemployment rate in equation (10), we have the following result:

**Result 4:** *A one percentage point increase in the wage subsidy rate has a stronger effect on lowering the unemployment rate the higher the initial rate of unemployment.*

Before leaving this section, it should be pointed out that the original article by Professor Robert Solow introducing the dependence of the effort function on a worker's remuneration made a worker's effort simply a function of the real wage, that is, the effort function is written as  $e(w^h)$ . As an example, suppose that  $e(w^h) = (w^h - \alpha)^\gamma$ ;  $0 < \gamma < 1$ . One way to interpret this function is to suggest that low wage workers need a real wage earning that would provide a minimum level of nutrition to be able to be fully functioning employees at the workplace. In this case, the efficiency wage is *independent* of the rate of unemployment and is given by the original Solow elasticity condition:

$$\frac{w^{h*} e'(w^{h*})}{e(w^{h*})} = 1.$$

With the specific effort function,  $e(w^h) = (w^h - \alpha)^\gamma$ ;  $0 < \gamma < 1$ , the efficiency wage,  $w^{h*}$  is equal to  $\alpha/(1 - \gamma)$ . This gives a rigid real wage; alternatively, the wage curve has infinite elasticity, that is,  $\epsilon = \infty$ . Using this value of  $\epsilon$  in equation (9) gives us

$$\frac{d \log(1 - u)}{ds^w} = \eta.$$

## 2.3 Search and matching model of labor market

Jobs are heterogeneous and there are frictions that prevent firms from getting their employees with the best fit for the job and workers from finding their ideal job immediately. Thus, at any point in time, some job vacancies are unfilled even as there are workers looking for jobs. A convenient device called a matching function summarizes the number of successful job matches as a function of the job vacancy rate (number of job vacancies per unit of the labor force) denoted  $v$ , and the unemployment rate (the number of unemployed persons per unit of the labor force) denoted  $u$ . We write the matching function as a constant-returns-to-scale function,  $m(v, u)$ . As an example, let  $m(v, u) = v^{0.5}u^{0.5}$ .

The unemployment rate,  $u$ , is increasing in the product of the job separation rate,  $s$ , and the average duration of unemployment. In turn, the average duration of unemployment is given by the inverse of the job accession rate,  $a \equiv m/u$ . With the particular form of matching function given in the last paragraph, the job accession rate is given by  $a = (v/u)^{0.5}$ . Thus the average duration of unemployment,  $1/a$ , is decreasing in the measure of labor market tightness,  $v/u$ , the number of job vacancies per unemployed worker. When the inflow into unemployment is equal to the outflow from the unemployment pool, we have  $s(1 - u) = au$ . Thus, we have

$$\frac{u}{1 - u} = s \left( \frac{1}{a} \right). \quad (11)$$

From equation (11), we get the following result:

**Result 5:** *Ceteris paribus, if a wage subsidy reduces the average duration of unemployment, it also reduces the rate of unemployment.*

Let us now study how a wage subsidy given to firms act to reduce the average duration of unemployment. To do so, we first study the decision of firms with regards to the creation of job vacancies. An asset-type equation is used to think about the problem. Let  $V_f$  be the asset value of having a filled job vacancy and  $V_v$  be the asset value of having an unfilled job vacancy. These asset values satisfy the following conditions:

$$rV_f = \Lambda - \left( \frac{w^h}{1 + s^w} \right) - s[V_f - V_v], \quad (12)$$

$$rV_v = -\Lambda c + \left( \frac{1}{a} \right) [V_f - V_v], \quad (13)$$

where we note that with the specific matching function we are using, the number of successful job matches per unit of job vacancy is given by  $m/v = 1/a$ . Here,  $r$  is the exogenous real interest rate,  $\Lambda$  is worker productivity, and we assume that it costs  $\Lambda c$  to maintain a job vacancy.

If there is free entry into the business of creating job vacancies, competition drives the asset value of having a vacant job to zero, that is,  $V_v = 0$ . Then, we note from equation (13) that  $V_f = a\Lambda c$ . Further using this in equation (12), we get

$$\left( \frac{w^h}{1 + s^w} \right) = \Lambda \left[ 1 - \frac{(r + s)c}{\left( \frac{1}{a} \right)} \right]. \quad (14)$$

The longer the average duration of unemployment, the shorter is the average duration of a job vacancy and thus the lower is the expected cost of maintaining a job vacancy. Accordingly, the wage that the firm can afford to pay is higher. Thus, the firm's affordable wage is rising in the average duration of unemployment.

There are two approaches to thinking about wage determination. One approach assumes that, as there are frictions in the labor market, both firm and worker have some bargaining power so the individual worker engages in decentralized wage bargaining with the firm, typically in the form of Nash bargaining. If we follow this approach, we solve an asset-type problem for the worker. Let the asset value to the worker in the state of being employed be  $V_e$  and the asset value in the state of being unemployed be  $V_u$ . Then, we have

$$rV_e = w^h - s[V_e - V_u], \quad (15)$$

$$rV_u = B + a[V_e - V_u], \quad (16)$$

where  $B$  is income support when unemployed. If we assume that the weight giving the bargaining strength of the worker is  $\beta$ , then the surplus that goes to the worker is given by the share  $\beta$  of total surplus, that is,  $V_e - V_u = \beta[(V_e - V_u) + V_f]$ , where we have taken account of the fact that  $V_v = 0$ . We can readily show that the bargained wage is given by

$$w^h = \frac{B + \left(\frac{\beta}{1-\beta}\right) \left[\frac{r+s+a}{1+r+a^{-1}}\right] \Lambda(1+c)}{1 + \left(\frac{\beta}{1-\beta}\right) \left[\frac{r+s+a}{1+r+a^{-1}}\right] \left[\frac{1}{1+s^w}\right]}. \quad (17)$$

We see from equation (17) that the bargained wage is decreasing in the average duration of unemployment.

Using equations (14) and (17), we can readily check that a wage subsidy given to the firm acts to lower the average duration of unemployment.<sup>9</sup> This

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<sup>9</sup>At each  $a^{-1}$ , the average duration of unemployment, an increase in  $s^w$  raises the affordable wage in equation (14) by more than it raises the bargained wage given by equation (17). Thus, the affordable wage can be reconciled to the bargained wage in the presence of a wage subsidy at a *lower* average duration of unemployment.



result can be explained as follows. The wage subsidy given directly to the firm lowers the firm's marginal cost of employing an additional worker thus increasing the firm's affordable wage. At a given average duration of unemployment, the affordable wage increases by exactly the amount  $1 + s^w$ . In addition, part, but only part, of the increase in the firm's surplus due to the wage subsidy goes to the worker given our assumption of Nash bargaining. Consequently, the bargained wage also increases when the firm receives the wage subsidy but it increases by less than the subsidy at a given average duration of unemployment. The result is that the bargained wage and affordable wage can only be reconciled at a lower average duration of unemployment.

How applicable is the assumption of Nash bargaining over wages? With Nash bargaining, the match between firm and worker is unsuccessful if there is no agreement on the wage. If our focus is on low wage workers, it is possible that a more realistic assumption about wage determination is simply that the firm offers to potential workers a wage that it posts on a take-it-or-leave-it basis with no opportunity for the worker to make a counteroffer. Suppose that the posted wage is given exogenously as  $w^{h*}$ . Then, substituting the posted wage in equation (14), we obtain

$$\left( \frac{w^{h*}}{1 + s^w} \right) = \Lambda \left[ 1 - \frac{(r + s)c}{\left( \frac{1}{a} \right)} \right]. \quad (18)$$

Taking a derivative through equation (18), we obtain the elasticity of the average duration of unemployment with respect to  $s^w$  as given by

$$\frac{d \log \left( \frac{1}{a} \right)}{ds^w} = - \left[ \frac{\left( \frac{1}{a} \right)}{(r + s)c} - 1 \right]. \quad (19)$$

## 2.4 Wage subsidies when output is constrained by aggregate demand

The models of labor market behavior we have studied so far to understand the workings of a wage subsidy given directly to a firm all implicitly assume that the output produced by employed workers *can be sold*. Yet, one issue that arose in the recent credit crisis, and in other recessions, is that firms are not hiring because the output produced by workers cannot be sold. Aggregate demand, it is argued, constrains sales. With low aggregate demand in the presence of sluggish nominal price levels, firms are not willing to hire because they can't sell the goods produced. How does a wage subsidy work in such an environment?

There is a new channel through which a wage subsidy given to firms operate in such an environment. To see this, consider the following simple two-period model. In the short run, the nominal price is rigid so in period 1, output is determined by aggregate demand,  $\bar{Y}^{AD}$ . If the production function is given by  $F(N)$ , then employment is simply given by  $N = F^{-1}(\bar{Y}^{AD})$ . Let us suppose that firms choose to pay efficiency wages to its employed workforce in period 1 and 2,  $w_1^{h*}$  and  $w_2^{h*}$ , respectively. The present discounted value of the firm's cash flows,  $V_1$ , can be written as

$$V_1 = \bar{Y}_1^{AD} - \left( \frac{w_1^{h*}}{1 + s_1^w} \right) F^{-1}(\bar{Y}_1^{AD}) + \frac{F(e(w_2^{h*})N_2) - \frac{w_2^{h*}}{1 + s_2^w}}{1 + r}. \quad (20)$$

If a firm in period 1 faces a sudden unexpected decline in aggregate demand,  $\bar{Y}_1^{AD}$ , it is possible that  $V_1$  can turn negative in the absence of a wage subsidy. With the firm paying efficiency wages, so that there are limits to wage cuts, it is optimal for the firm to shut down if  $V_1 < 0$  leading to a retrenchment of the

whole workforce. In such an environment, a wage subsidy paid to firms can turn the value  $V_1$  from negative to positive thus improving the survivability of firms and thus the retention of workers. This may be especially important for small and medium-sized business firms that face limited access to credit markets in a recessionary environment.

Yet another channel through which a wage subsidy given directly to a firm can help in reducing retrenchments during a recession is by encouraging labor hoarding for the short term. Employees at firms tend to develop firm-specific expertise that new hires need time to acquire. Thus employing a new worker always involves some firm-specific training that adds to the firm's cost. If a recessionary shock is expected to be short-lived, the firm has an incentive to hold on to its workforce until the economy recovers. In such a situation, wage subsidies to firms give the extra financial muscle for more firms to hold on to their workers. We have another result:

**Result 6:** *In the short run when sales are constrained by aggregate demand due to nominal price sluggishness, a wage subsidy given to firms can turn the present discounted value of firms' cash flows from negative to positive thus improving the survivability of firms and thus the retention of workers. It also encourages labor hoarding over the short term.*

## **2.5 Quantitative magnitudes: Some illustrative numbers**

To get a sense of empirical magnitudes of the effects of a wage subsidy in a neoclassical model of the labor market, we can use some illustrative values of

the elasticities based upon the useful survey of Professor Lawrence Katz.<sup>10</sup> Suppose that the labor supply elasticity ( $\epsilon$ ) is approximately 0.4 and the labor demand elasticity ( $\eta$ ) is approximately 0.5. Substituting these elasticity values into equations (3) and (4) yields the result that a 10 percent subsidy rate would expand employment by approximately 2 percent and take-home wage rate by approximately 5 to 6 percent.

The neoclassical model has the feature that a worker who is not currently employed is out of the labor force. There is no unemployment. Turning to the efficiency wage model, where there exists job rationing, if we take the elasticity of the labor demand curve to be 0.5, and recalling that the elasticity of the wage curve is larger the higher is the initial rate of unemployment, we can consider the following illustrative numbers. If unemployment income as a ratio to take-home pay ( $B/w^h$ ) is 0.5 and the initial unemployment rate is 0.25, we find that substituting these elasticity values into equations (8) and (9) yields the result that a 10 percent subsidy rate would expand the employment rate by approximately 3 percent and take-home wage rate by approximately 4 to 5 percent. If, instead, the unemployment income as a ratio to take-home pay ( $B/w^h$ ) is 0.5 and the initial unemployment rate is 0.40, we find that substituting these elasticity values into equations (8) and (9) yields the result that a 10 percent subsidy rate would expand the employment rate by approximately 3.5 to 4 percent and take-home wage rate by approximately 3 percent. The higher elasticity of the wage curve leads to

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<sup>10</sup>See Lawrence Katz, 1998, "Wage Subsidies for the Disadvantaged," in Peter Gottschalk and Richard Freeman, eds., *Generating Jobs : How to Increase Demand for Low-Skilled Workers*, New York: Russel Sage Foundation, pp. 21-54.

a bigger impact on employment and smaller impact on take-home pay. In the case where the worker's effort function depends only on the real take-home wage so that the efficiency wage is also a rigid real wage, we find that a one-percent subsidy rate increases the employment rate by the size of labor demand elasticity,  $\eta$ . If we take  $\eta = 0.5$ , we obtain the result that a 10 percent wage subsidy raises the employment rate by 5 percent.

Finally, turning to the search and matching model with wage posting so that low wage workers do not make counteroffers in a wage bargaining situation, we can ask how much impact there is on the average duration of unemployment and thus on the unemployment rate of a wage subsidy rate of 10 percent. Returning to equation (11), if  $u = 0.25$ ,  $s = 0.3$ , we get an average duration of unemployment of a calendar year. Suppose, in addition,  $r = 0.1$  and  $c = 0.3$  where  $c$  gives the fraction of the cost of maintaining a job vacancy taken as a ratio to worker productivity,  $\Lambda$ . We find that with these parameters, a 10 percent subsidy rate reduces the average duration of unemployment by about 70 percent, that is, it reduces the average duration of unemployment from a year to about four months. Using equation (11), this implies that the unemployment rate is reduced from 25 percent to about 8 percent, which represents a 23 percent increase in employment rate.<sup>11</sup> This number is far greater than what we have found in the neoclassical model and efficiency wage model of the labor market and most likely gives an upper

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<sup>11</sup>The calculation is as follows: At an unemployment rate of 25 percent and an annual job separation rate of 30 percent (so the average duration of a job is about three years), we get that the average duration of unemployment is about a year. If the average duration of unemployment is reduced by a wage subsidy to four months or one-third of a year, using the formula in equation (11) gives  $u/(1-u)=(0.3)(0.3)=0.09$  so  $u=0.08$ .

bound since a policy that has such a large effect on reducing the average duration of unemployment most likely would put upward pressure on the wage rate, which would act to reduce the impact of the wage subsidy.

## **2.6 Does it matter whether wage subsidy is given directly to firms or to workers?**

We have so far focussed our discussion on giving the wage subsidy directly to firms. Does it matter for the incidence of the wage subsidy whether the wage subsidy is given directly to firms or workers. One result in public finance theory is that, in the neoclassical model of the labor market, the *incidence* of the wage subsidy is independent of whether the wage subsidy is given directly to firms or workers. When given directly to firms, as we have seen, the labor demand curve is shifted up, and as a result, employment is higher and workers' take-home pay is increased. How much employment and take-home pay are increased depends upon the respective elasticities of labor demand and labor supply. If the wage subsidy were given directly to workers instead, the labor supply curve shifts right and employment expands. Although the wage cost faced by firms is reduced because of the excess supply of labor induced by the wage subsidy to enter the labor force, the take-home pay is increased due to the wage subsidy or wage income supplements. Despite this important equivalence result in public finance theory, in practice, due to the fact that information flow about the wage subsidy scheme to either side of the labor market is likely to be imperfect, it matters whom the wage subsidy is given directly to. Firms are more likely to be aware of a wage subsidy if it is given directly to them, and so can act in response to the financial

incentives by increasing their labor demand. Particularly in the search and matching model of the labor market where imperfect informational flows are emphasized, a firm is less likely to be informed about a wage supplement scheme that gives wage subsidies directly to workers. Therefore, if a wage subsidy scheme is to be implemented in a recessionary environment, where immediate action is important, it seems preferable to give wage subsidies directly to firms to boost their demand for labor.

If the economy's structural rate of unemployment is very high among low wage workers even when the economy is *not* in a recession, it appears that the increased intensity of search for jobs that a wage subsidy given directly to workers should induce would not have very much effect on the unemployment rate.<sup>12</sup> The problem of high unemployment might have more to do with the reluctance of firms to hire than with the reluctance of workers to search for jobs. Firms, on the other hand, are likely to be more responsive to creating additional job vacancies in response to a wage subsidy given directly to them.

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<sup>12</sup>If workers and firms engage in decentralized Nash bargaining over wages, giving a wage subsidy directly to workers will lead to part of the surplus being given to firms in the form of lower hiring cost which stimulates employment. However, if low wage workers cannot make counteroffers and face posted wages, the channel through which giving wage subsidies directly to workers can expand employment is through increased intensity of job search. As argued in the text, the problem of high structural unemployment might have less to do with workers' reluctance to search for jobs and have more to do with the lack of incentives on the part of firms to create job vacancies.

### 3 Empirical Evidence

This section summarizes the findings of work done by others to evaluate the effectiveness of wage subsidies introduced either as a short-term countercyclical policy measure or as a long-term structural policy to boost the earnings and employment of low wage workers. We first report the findings on countercyclical policies and then go on to look at findings on structural policies aimed at boosting pay and employment.

(a) Bishop, John, 1981, “Employment in Construction and Distribution Industries: The Impact of the New Jobs Tax Credit,” in Sherwin Rosen, ed., *Studies in Labor Markets*, Chicago and London: The University of Chicago Press.

The New Jobs Tax Credit (NJTC) program introduced in the United States in 1977 and effective from mid-1977 through 1978 under President Jimmy Carter offered to employers a tax credit of 50 percent of the first \$4,200 of wages per employee for increases in employment that was more than two percent over the previous year. In being paid only on employment in excess of some specific level, this is an example of a marginal subsidy. The purpose of the wage subsidy was to stimulate employment after the 1973-75 recession. The total amount that a firm could claim as a tax credit was limited to \$100,000 per year.<sup>13</sup> The economist John Bishop studied the effect of this scheme using time series analysis of the construction, retailing, and wholesaling industries. He found that the NJTC program was responsible for

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<sup>13</sup>See Daniel Hamermesh, 1993, *Labor Demand*, Princeton: Princeton University Press.



150,000 to 670,000 of the more than 1 million increase in employment that occurred between mid-1977 and mid-1978 in the construction and retailing industries. Another way of summarizing his results is that the point estimates of the increase in employment that the tax credit stimulated by March 1978 was approximately 400,000, equivalent to an economywide increase in employment of 0.5 percent. The program cost roughly \$4.5 billion.<sup>14</sup>

Another study of the NJTC program using an analysis of the Department of Labor survey conducted by the Bureau of the Census found that firms which knew about the program increased employment 3 percent faster than other firms.<sup>15</sup>

(b) Gera, Surendra, 1987, "An Evaluation of the Canadian Employment Tax Credit Program," *Canadian Public Policy*, Vol. 13, No. 2, pp. 196-207.

The paper by Gera evaluates the 1978-81 Canadian Employment Tax Credit Program (ETCP), which was structured like the NJTC program except that it was targeted at high unemployment regions. The program provided a tax credit of varying amounts per hour, with higher rates for higher unemployment areas, to employers who would create jobs defined as additional to their normal workforce. The paper concluded that the net social benefit resulting from the creation of an ETCP job was very significant, amounting to about 60 percent of the wage bill. It found that the greatest benefit came from the creation of jobs in areas characterized by high unem-

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<sup>14</sup>See Hamermesh, *ibid.*, page 192.

<sup>15</sup>See Perloff, Jeffrey and Michael Wachter, 1979, "The New Jobs Tax Credit: An Evaluation of the 1977-78 Wage Subsidy program," *American Economic Review: Papers and Proceedings*, Vol. 69, No. 2, pp. 173-179.

ployment rates. It found, however, that only 33 percent of the jobs attributed to the ETCP during the first two years of its operations represented an incremental gain in employment. The average cost per incremental work-year created by the ETCP was estimated to be \$9,555 (1979 dollars)

(c) Goos, Maarten and Jozef Konings, 2007, “The Impact of payroll Tax Reduction on Employment and Wages: A Natural Experiment using Firm Level Data,” LICOS Discussion Papers, No. 178, Katholieke Universiteit Leuven.

Goos and Konings study the impact of a scheme where wage subsidies were given directly to firms in Belgium as a structural policy. Belgium has adopted the granting of wage subsidies to firms as a structural policy since 1983 under the name Maribel. In Maribel I introduced in 1983, employers were given a reduction of 6.17 percentage points in employer contributions for each full-time manual worker employed in the private sector, except for firms in electricity, gas and water as well as financial intermediation. There were various modifications through the years and “Maribel subsidies” ended in the second quarter of 1999. From 1999 to 2004, employer tax exemptions gradually converged towards a harmonized system of proportional and lump-sum reductions for both manual and non-manual labor.

The authors used a panel of firm-level data with information about whether or not a firm received subsidies and, if so, the amount of the subsidy received in any given year. With the data set, the authors were able to examine the impact of the wage subsidies given to firms on employment and wages. Their headline finding was that wage subsidies given to firms increased full-time

manual employment by 5 to 8 percent and pre-tax wages by 1 to 3 percent without much evidence for displacement effects on other workers.

(d) Eissa, Nada and Jeffrey Liebman, 1996, "Labor Supply response to the Earned Income Tax Credit," *Quarterly Journal of Economics*, Vol. 111, No. 2, pp. 605-637.

The Earned Income Tax Credit (EITC) is an example of a structural program of wage subsidies given directly to workers. In a series of major expansions since 1987, the EITC has grown to become a preferred program to supplement a worker's income by tying the subsidy to work. The EITC is a refundable credit so that any credit due in excess of tax liability is refunded to the taxpayer in the form of a tax refund check. The paper by Eissa and Liebman studied the impact of the Tax reform Act of 1986, which included an expansion of the EITC, on labor force participation and hours of work. The expansion of the credit affected single women with children but should not affect single women without children. This feature allowed the authors to conduct an empirical test identifying a treatment group (single women with children) and a control group (single women without children). They found that between 1984-1986 and 1988-1990, single women with children increased their relative labor force participation by up to 2.8 percentage points. They observed no change in the relative hours worked by single women who were already in the labor force.

## 4 Wage Subsidies in the Context of Growth and Economic Inclusion in the Singapore story

Using the concept of a production function, it is helpful to represent a nation's output or real GDP as a constant-returns-to-scale function,  $Y = AF(K, hN)$ , where  $A$  is a measure of technology,  $K$  is physical capital stock,  $h$  is the average educational attainment, and  $N$  is employment. In a market economy, a firm's choice of the optimal number of workers to employ requires that the following condition be satisfied:

$$AhF_{hN}\left(\frac{K}{hN}, 1\right) = \frac{w^h}{1 + s^w}. \quad (21)$$

While our focus in this paper has been on how an increase in the wage subsidy rate,  $s^w$ , has the potential to expand employment and lift up the real earnings of low wage workers, equation (21) puts into context that there are other factors that also affect employment and real earnings, particularly over the medium to long term. Three other factors that play a part in improving the lives of workers are technology, education, and investment activity.

To see how these three factors play a part in strengthening economic inclusion—drawing people in the economy to be engaged in the formal workplace and delivering a good living wage—we turn to the experience of Singapore. Four charts at the back of this paper providing time series data on a measure of the standard of living (real GDP per capita), the unemployment rate, a measure of the skilled-unskilled wage gap, and the inflation rate tell a story of how it is possible to lift a whole nation from relatively high

unemployment and low standard of living to relative economic prosperity.

Going from under 20 percent of U.S. standard of living in 1960 to about parity today involved harnessing the right institutions and policies to generate catch-up growth. The decision of early political leaders in Singapore to become economically integrated into the global economy through trade in goods, capital, and ideas allowed the nation to enjoy the benefits of closing the wide technology gap at independence. As the economy raced towards the world technology frontier, private investments grew to take advantage of the relatively large supply of unskilled labor in the early days of industrialization to produce goods to sell into the world market. As the competitive industries in the early days of industrialization were relatively unskilled labor intensive, there was a relative increase in demand for unskilled workers which lifted the earnings of low wage workers and lowered their unemployment rate. The chart on the unemployment rate shows the general decline of unemployment as the economy grew, even though the path of the unemployment rate was by no means smooth.<sup>16</sup> Because the forces of technology catch-up were so strong, causing the value marginal product of labor to steadily increase, the government was able to rely on the defined contribution social security system, called the Central Provident Fund (CPF), already in place before independence to raise the contribution rates of both employees and employers without hurting jobs. By the early 1980s, an employee contributed 25 percent of his or her basic wage to the CPF and the employer contributed the same amount to the worker's retirement fund.<sup>17</sup> The employers' CPF contribu-

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<sup>16</sup>The chart of the inflation rate shows that, apart from the spike in the inflation rate during the oil crisis of the 1970s, the country has experienced non-inflationary growth.

<sup>17</sup>Workers can withdraw their retirement funds at 55 years of age but must maintain a

tion rates provided the government an instrument to fight recessions, which it used in 1985-86 when the economy went into a sharp recession. A major plank of the counter-recessionary policy was to give firms wage subsidies through a big reduction in the employers' CPF contribution rates, effectively reducing the firms' marginal cost of employing an additional worker. This CPF contribution rate cut applied to each worker on the firm's payroll. When the economy recovered, the CPF contribution rates were gradually restored. Similar measures were adopted during the 1997-98 Asian financial crisis and later in 2003 when the economy faced a huge collapse of domestic aggregate demand in the face of a virus contagion known as Severe Acute Respiratory Syndrome (SARS).

It is interesting to note that the wage subsidies to firms given through the cut of employers' CPF contribution rates in all these episodes received support of the country's labor union called the National Trades Union Congress (NTUC). It required a level of trust among union leaders, business leaders, and government (which was itself a major public sector employer) built on the understanding that the sacrifice made by workers during the recessions would be rewarded when the economy recovered. Indeed, the CPF contribution rate cuts implemented at the height of the recessions were restored when the economy was well on the recovery path, typically in a few steps.

In these earlier episodes, as the cut in the employers' CPF contribution rates were not made up by government, workers' essentially faced wage cuts in order to save their jobs. In the 2009 sharp recession, however, the government stepped in to introduce a Jobs Credit scheme that subsidized each worker on 

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minimum sum in their CPF account that can be used to purchase an annuity.

a firm's payroll by an amount equal to 12 percent of pay up to the amount S\$2,500, the median worker's wage in Singapore. As we can see from the first two charts, despite the sharp drop in real GDP per capita in 2009, the rise in the unemployment rate was comparatively smaller.<sup>18</sup>

In the process of growth, the government's fiscal position improved as companies were set up and jobs were created thus increasing the tax base. The government had increased resources that it used to make huge investments in education. The improvement in the average level of human capital of the workforce shifted the country's comparative advantage in each decade

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<sup>18</sup>After reading an earlier draft of this paper, Paul Romer raised a question, "If the government was using wage cuts in the earlier recessions, what explains the smaller rise in unemployment in 2009?" In response, I suggest that the nature of the shock in 2009 was somewhat different from the 1980s. The nature of the major economic shock that caused the 1985 to 1986 recession is the rapid wage increase not matched by productivity growth in the early 1980s. Thus, despite the quantitatively large CPF rate cut on employers' contribution, it only partly reversed the original cause of the recession. In the 2009 recession, however, the shock was a fall in aggregate demand shown up as a collapse of export demand. The wage subsidy to firms directly reduced firms' marginal factor cost and helped small businesses survive in 2009.

The rapid speed of policy response in 2009 also played a part. The economy registered negative 1.6 percent real GDP growth in 1985 and unemployment in 1985 was 4.1 percent compared to 2.7 percent in 1984. The Economic Committee chaired by the current Prime Minister submitted its recommendations in February 1986 and the CPF rate cuts took effect only in 1986. On the other hand, the Jobs Credit scheme was announced in Parliament during the budget speech in January 2009 and put into effect immediately. Firms were told that if they kept workers in the first quarter of 2009, they would get the wage subsidy based on what their workers earned in the last quarter of 2008. The Jobs Credit continued until end June 2010, on a reduced scale in the first half of 2010.

of growth towards more skill-intensive economic activity. Over the 1980s and 1990s, growth was broad-based so that, even as the median worker's skill level improved due to the huge investments in education, the earnings of less skilled workers were pulled up proportionately more so the wage gap measure showed a decrease. Nevertheless, in the past decade, the wage gap has shown an increase prompting the government in 2007 to introduce the Wage Income Supplement (WIS) scheme as a structural policy to boost the earnings of workers in the bottom quintile. By the time the WIS scheme was introduced to benefit workers in the lowest quintile, giving wage income supplements to those aged above 35 and earning less than S\$1,500 and who must have worked for at least six months in a year, the overall unemployment rate had already fallen to the two to four percent region. The intent of the WIS is to bolster the pay of low wage workers while giving them incentives to hold a job.

## **5 Concluding Remarks**

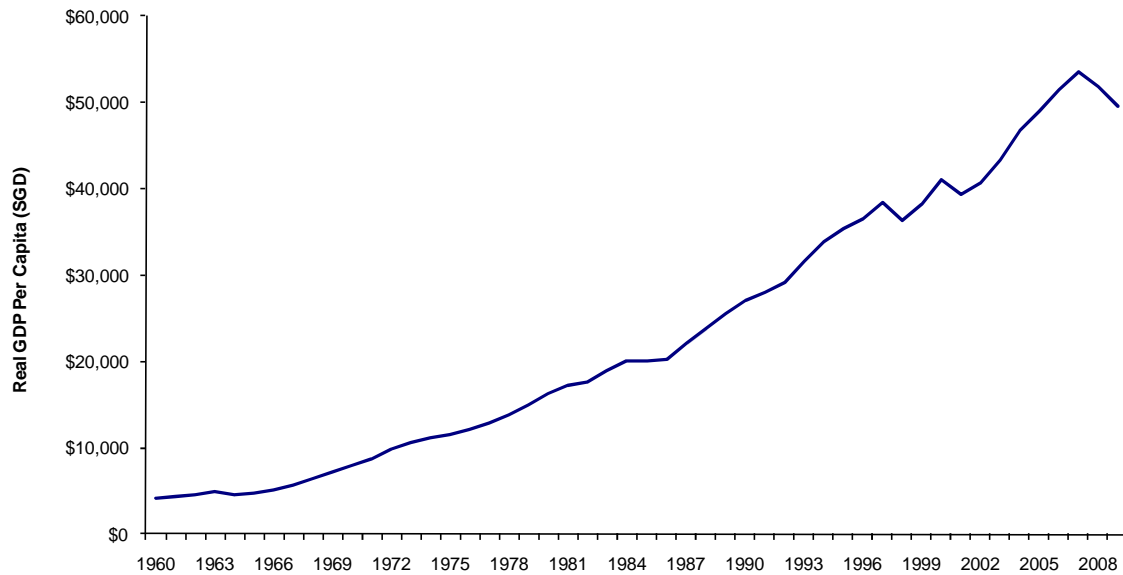
When one considers the potential for catch-up growth, one can only be optimistic about economic possibilities. A reliable way for a nation to foster economic inclusion is to rely on market mechanisms to bolster the pay and employment of its workforce, particularly those of its low wage workers. When a recession worsens the job prospects of an economy that, in more normal circumstances, is already struggling with high structural unemployment, as is the case in South Africa, wage subsidies given directly to firms act to lower the cost of employing an additional worker and thus to push out their



demand for labor. As jobless low wage workers are re-integrated into the formal workplace through a wage subsidy scheme, a time-consistent and fiscally responsible program to pursue growth opportunities over the medium to long term holds the promise of making life better for all the country's citizens.

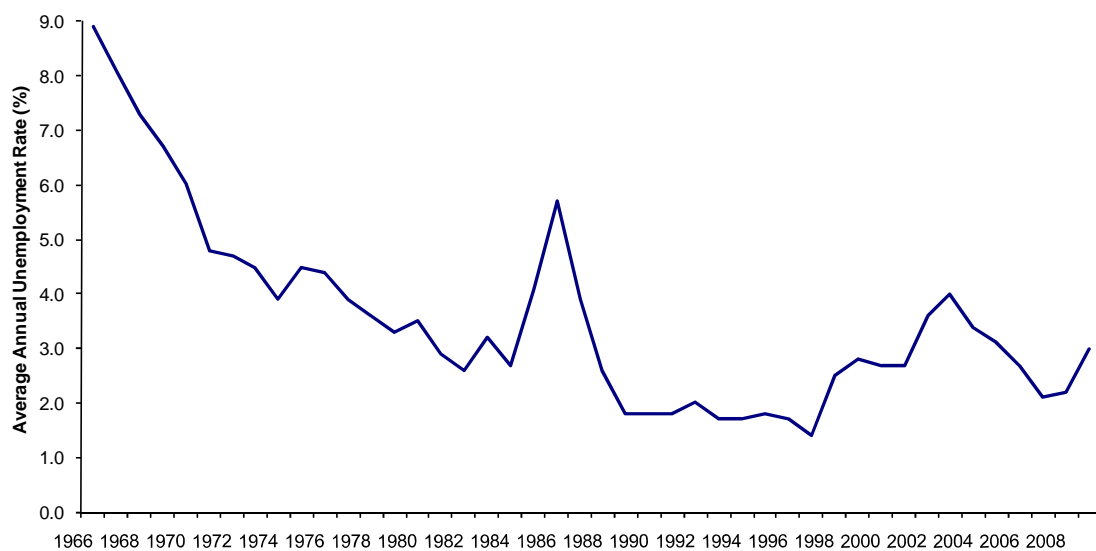
## Graphs for Singapore Statistics

### Real GDP per capita



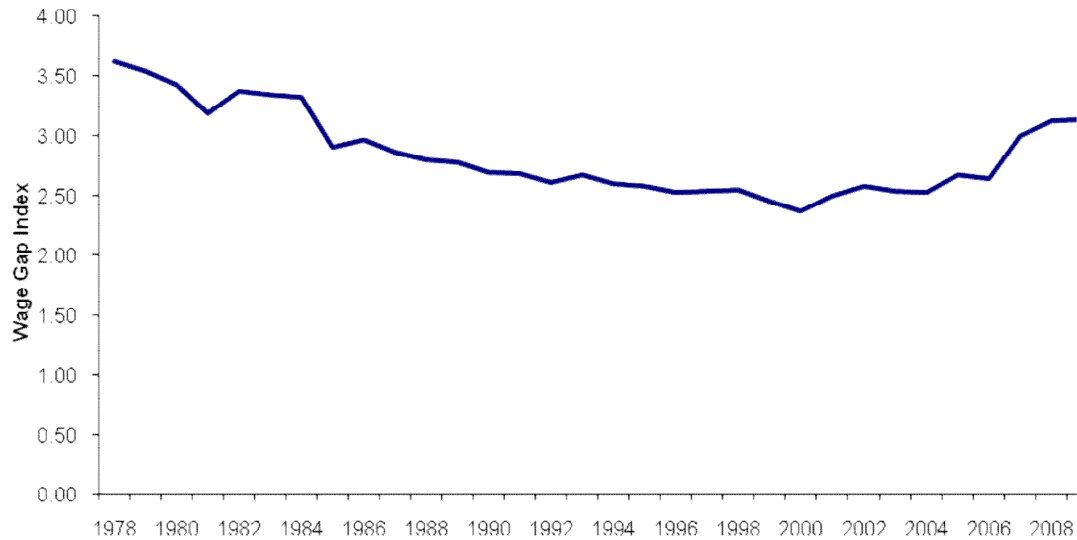
Source: Singapore Department of Statistics  
Note: GDP at 2005 Market Prices

### Unemployment Rate



Source: Ministry of Manpower, Labour Force Survey except for June 1995 and 2005 (General Household Survey) and June 2000 (Census of Population)  
Note: Data prior to 1986 are unemployment rate as at Jun of the year.

## Wage Gap Index

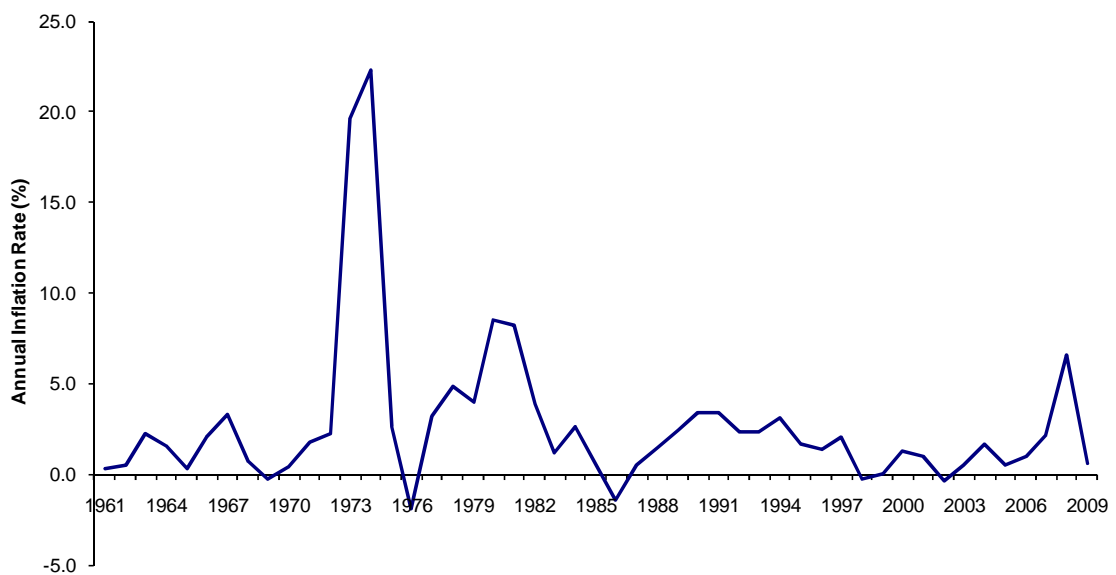


Source: Ministry of Manpower, Computed from Yearbook of Statistics and Report on Wages in Singapore

Notes: (1) Data are average monthly gross wages as at Jun of the year.

(2) The wage gap index is constructed as a ratio of the weighted-average wage of professional workers, comprising the occupation classes of Managers, Professionals, and Technicians and Associate Professionals to the weighted-average wage of production workers, comprising the occupation classes of Production Craftsmen and Related Workers, Plant and Machine Operators and Assemblers, and Cleaners, Labourers and Related Workers.

## Inflation Rate



Source: Singapore Department of Statistics