"A NOTE ON FIRING COSTS AND SEVERANCE BENEFITS IN EQUILIBRIUM UNEMPLOYMENT"

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A Note on Firing Costs and Severance Benefits in Equilibrium Unemployment

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Abstract

This note explores some of the effects of firing costs and severance benefits in Pissarides (1985) model of unemployment and vacancies. In this setup, the labor market effects of firing costs incurred by the firm and severance benefits received by the worker derive from the difference between the two. When this difference is positive, we show that an exogenous increase in the separation rate leads to an increase in the equilibrium unemployment rate and the unemployment-vacancy ratio. In addition, the sensitivity of the unemployment rate to the job separation rate is positively related to the excess of firing costs over severance benefits.

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1. Introduction

This note explores some of the effects of severance benefits on the behavior of unemployment and vacancies in a well-specified model in which explicit analytic results are available. As a vehicle we employ a framework first proposed in this Journal by Pissarides (1985) to analyze the effects of employment subsidies and unemployment benefits under various financing assumptions. This model has the distinct advantage of simplicity, yet highlights many important phenomena of labor markets, especially the high amount of turnover observed in some segments (Blanchard and Diamond 1989 and Burda and Wyplosz 1989).

Our results can be summarized as follows. In this setup, the most important determinant of the macroeconomic effects of firing costs incurred by the firm and severance benefits received by the worker is the difference between the two. Indeed, in the case when the cost of severance to the firm is equal to the benefit received by the worker, there is no effect on employment and vacancies in equilibrium, since the bargained wage falls by the expected value of the benefit.

Second, we examine the effects of changes in the economy's parameters when when the firing costs exceed the benefits

received. Under these conditions, an exogenous increase in the separation rate leads to an increase in the equilibrium unemployment rate and the unemployment-vacancy ratio. An increase in the burden to the firm over the benefit received by the worker has similar effects. Finally the sensitivity of the unemployment rate response to the separation rate is positively related to the excess of firing costs over severance benefits.

These results have interesting policy implications. First, balanced reductions in the severance bonus paid to workers by firms may not yield improvement in labor market outcomes. Conversely, government subsidies of layoffs or severance benefits, observed in countries such as Japan and Sweden, may constitute economically sensible policy. Finally, in periods of high labor market turnover and structural change, it may be appropriate to pursue these policies even more aggressively.

2. The Model

A. Structure

The model draws from Pissarides (1985) exposition, with the key modification that severance is costly. We consider an economy consisting of a very large number of identical, risk-neutral firms and workers. Each firm produces output according to the same technology and employs one worker. There is free entry. With a

worker, the firm can produce output q in the current period. At the end of the period a fraction s of these relationships will go sour: the worker-firm pair is dissolved and the firm may post a vacancy and the worker resumes search. If the firm has posted a vacancy in the current period, it cannot produce. At the end of the elementary period, the slot is either filled with a productive worker or remains vacant in the consecutive period.

A central component of the model is the matching technology which puts workers and firms in contact with each other. This function is assumed to have constant returns to scale and maps the number of unemployed u and the number of vacancies on offer v into the number of productive job matches x: $x=x(u,v)<\min(u,v)$ with $x_1,x_2>0$, $x_{12}>0$ and $x_{11},x_{22}<0$. Standard in labor economics, this function captures the fact that locating productive matches in a decentralized setting is not trivial.[1] Henceforth the labor force is normalized to unity, so u and v are also the unemployment and vacancy rates, respectively. It follows that the job finding rate f for unemployed is $x/u=x(1,v/u)$ and the vacancy filling rate h of the firm $x/v=x(u/v,1)=(u/v)f$. The constant returns assumption implies the invariance of the job finding and vacancy filling rates with respect to the absolute size of the economy.

If fraction s of all employment relationships end in separation at the end of each period, then a flow equilibrium

condition for the labor market must be

$$(1) \qquad (1-u)s=x(u,v)$$

This curve is drawn as the u-v curve in Figure 1. Note that it is downward sloping, since total differentiation of (2) yields $dv/du= -(s+x_1)/x_2$.

The behavior of workers is characterized by their valuation of the state of unemployment versus that of having a job. Wages w and unemployment benefits b are paid at the end of the period, as in Pissarides (1985).[2] In addition, if there is a severance (a transition from employment to unemployment) a benefit $T+\theta w$ is received by the worker, where $\theta \geq 0$. The conditions of the bonus package are taken by workers and firms as given.[3] Let W and U be the present discounted value of working and unemployment respectively, using discount rate r. It follows that for the ith worker receiving wage w_i,

$$(2) \qquad W_i = w_i/(1+r) + s(U + T)/(1+r) + (1-s)W_i/(1+r)$$

where U is taken by the worker as given. It can be shown that the difference between the two valuations W_i and U is given by

$$(3) \qquad W_i - U = \frac{1}{r+s} \{w_i(1+s\theta) + sT - rU\}$$

which may be regarded as the worker i's net return from having a job now at wage w_i.

Next we discuss the behavior of firms. A firm may either employ a worker or, lacking one, post a vacancy. If the job is already filled at the beginning of the period, output q is produced; otherwise the firm may post a vacancy at cost k. If a severance occurs, the firm pays $F+\theta w$, where F is not necessarily equal to T. If J and V are the present values of the firm in the two states and all revenues and costs are incurred at the end of the period, we have

$$(4) \qquad J_i = (q-w_i)/(1+r) + s(V-F-\theta w_i)/(1+r) + (1-s)J_i/(1+r)$$

similarly it can be shown that

$$(5) \qquad J_i - V = \frac{1}{r+s}\{q-w_i(1+s\theta) - sF - rV\}.$$

B. Wage Determination

Wages are determined by Nash bargaining between the meeting parties. Since there is no heterogeneity, all wages are equal in equilibrium. The bargaining process for the ith worker-firm pair maximizes the weighted combination of the gains to both parties from reaching an agreement; i.e. solves

(6) $$\max_{w_i} (J_i - V)^{(1-\beta)} (W_i - U)^{\beta}$$

where workers' bargaining strength is parametrized by β, $0<\beta<1$. The first order condition is

$$\beta(J_i - V)\partial(J_i - V)/\partial w_i = (1-\beta)(W_i - U)\partial(W_i - U)/\partial w_i$$

From (3) and (5) we have $\partial W_i/\partial w_i = -\partial J_i/\partial w_i = (1+s\theta)/(r+s)$, so the solution is characterized by

(7) $$(J_i - V)/(W_i - U) = (1-\beta)/\beta.$$

C. Unemployment, Vacancies, and Wages in Equilibrium

The number of posted vacancies is fixed by a zero profit condition. As in Pissarides (1985), vacancies cost k to post and maintain each period; in the steady state, $J_i = J$ for all i so

(8) $$V = -k/(1+r) + hJ/(1+r) + (1-h)V/(1+r)$$

Combining (8) with (4) and solving for V yields

(9) $$V = \frac{1}{r(r+s+h)} [h(q-(1+s\theta)w-sF) - k(r+s)]$$

which is similar to equation (12) in Pissarides (1985). If free entry of firms in equilibrium is characterized by V=0 we have

(10) $$k(r+s) = h(q-(1+s\theta)w-sF)$$

Note that (10) implies that for a given wage, an increase in either F or θ will be associated with an equilibrium increase in

h, the rate at which firms fill their posted vacancies. As will be shown shortly, this occurs because the equilibrium rate of unemployment u and the unemployment-vacancies ratio u/v are higher.

The worker's equilibrium valuation of the state of unemployment is

$$(11) \qquad U = b/(1+r) + fW/(1+r) + (1-f)U/(1+r)$$

where f is the job finding rate as defined above. Returning to (3), we can combine (2) and (11) to obtain the worker's return from unemployment when $W_i = W$:

$$(12) \qquad W-U = \frac{1}{r(r+s+f)}\,[w(1+s\theta) + sT - b].$$

Exploiting the fact that from (10) (r+s) can be expressed in equilibrium as $h(q-(1+s\theta)w-sF)/k$, we write (12) as

$$(13) \qquad W-U = \frac{k}{h[(q-(1+s\theta)w-sF)-kv/u]}\,[w(1+s\theta)+sT-b].$$

Explicit solution for the equilibrium wage in terms of the model's parameters is now possible. Equations (10) and (2) plus the V=0 condition imply J=vk/x; inserting this and (13) into (7) yields a final expression for the equilibrium wage:

$$(14) \qquad w = \frac{1}{(1+s\theta)}\,[\beta(q+ kv/u -sF) + (1-\beta)(b-sT)]$$

Note that for the match to have positive outside value to the

meeting parties, $q+kv/u-s(F-T)-b>0$.

Equation (14) has a convenient interpretation. As in most models, the bargaining outcome is a weighted average of the two net gains obtaining from the match. The severance benefit reduces the single-period "fallback position" of the worker; the employment relationship is more desirable by the amount sT in expectation.[4] Similarly, the value of the match to the firm is diminished by the expected value of the severance cost, sF. The wage related severance benefit parameter θ has a powerful negative effect on the wage in equilibrium as well: in the neighborhood of $\theta=0$, a one percentage point increase in the rate of pay-related benefit reduces the equilibrium wage by an equal amount.

Some interesting conclusions may be drawn already from (14). First, in the case when F and T are equal, the equilibrium wage w is reduced by exactly the expected value of the severance benefit, sT. Second, if we rewrite (14) as

$$(15) \qquad w = \frac{1}{(1+s\theta)} [\beta(q+ kv/u) + (1-\beta)b - sT + \beta s(T-F)]$$

we see that T>F means higher wages than in the T=F case (workers have a higher fallback position), whereas T<F implies lower wages (firms have a higher fallback position). Third, when F and T are not equal, the effect on wages depends on the relative bargaining strength of the workers. As $\beta\to 0$ (firms have all the power) the

wage falls by sF; as $\beta \to 1$ (workers have all the power), the wage falls by sT. While this may appear paradoxical, this is a direct result of the Nash cooperative bargaining assumption.

We now characterize the full equilibrium of the model. Insert (14) into (10) to obtain:

$$(16) \qquad h[(1-\beta)(q-b)-\beta k(v/u) + s(1-\beta)(T-F)] = (r+s)k$$

This set of points in v-u space is called the $\dot{V}=0$ locus, and is the upward-sloping curve in Figure 1. When combined with (1) it closes the system. It is important to note that since $h=x(u,v)/v=x(u/v,1)$, (16) is a function of u/v only. Thus the $\dot{V}=0$ locus is a straight line emanating from the origin.

Because F and T do not affect the u-v locus, it follows that when F=T, unemployment and vacancies in this model are invariant to the level of severance benefits.[5] The intuition is simply that the bargained wage fully reflects the expected value of the severance bonus. Furthermore, it follows that regardless of (F-T), a "balanced" increase in both F and T (dT=dF) leaves both curves unaffected, and thus will not affect unemployment, vacancies or wages in equilibrium.

Thus the sign of (F-T) or the asymmetry of costs and benefits is crucial in understanding the effects of these institutions in the model. In most industrial economies, firms pay the full severance benefit received by the worker, and in addition incur

"red tape" costs of delays in production changes, legal proceedings, official approval, etc. Emerson (1988) has recently provided a summary of such institutions in European countries and how they differ from their counterparts in the United States and Japan. In the next section, we show that when the condition F>T is met, the effect of increases in separations will be to raise the equilibrium unemployment rate, and that this effect is positively related to the value of (F-T).

3. Some Comparative Statics Results

In this section we analyze the effects of changes in the separation rate s and the excess burden (F-T) of severance to the firm, which is assumed positive.

Result 1: If F>T, an increase in s unambiguously raises u and lowers v/u.

To see this we examine the effects of an increase in the exogenous separation rate for the two curves. First, an increase in s shifts the u-v curve outwards. Heuristically, a higher rate of turnover at the same unemployment is consistent with flow equilibrium only if the outflow out of unemployment is higher. But outflow f=x/u=x(1,v/u) is an increasing function of v/u; it follows that the level of vacancies must also have increased, ie

the curve must have shifted out.

To determine the effect of an increase in s on the V=0 locus, we first rewrite (16) as

$$(17)\quad x(1,v/u)[(1-\beta)(q-b+s(T-F))-\beta k(v/u)] = (r+s)k$$

differentiate totally and solve for d(u/v)/ds:[6]

$$(18)\qquad d(u/v)/ds = \frac{[k+(1-\beta)(F-T)x]}{x_1(1-\beta)(q-b+s(T-F)) + \beta k x_2(v/u)^2}$$

which is unambiguously positive as long as $F \geq T$.[7] Thus the V=0 locus shifts down when s rises. As Figure 2 show, this leads to both an increase in u as well as u/v, whereas the effect on equilibrium vacancies is ambiguous. When F=T on the other hand, the condition always holds, implying that this holds for the original model (Pissarides 1985) as well.

<u>Result 2</u>: <u>An increase in (F-T) unambiguously raises u and lowers v/u and v.</u>

To see this is more straightforward. Since the u-v locus is unaffected by (F-T), we simply differentiate (17) and solve for d(u/v)/d(F-T):

$$(19)\quad d(u/v)/d(F-T) = \frac{(1-\beta)sx}{x_1[(1-\beta)(q-b+s(T-F)) -\beta k(v/u)]+\beta kx(v/u)^2}$$

or using the fact $x(u/v,1)= (u/v)x_1+x_2$, we have

$$(20) \qquad d(u/v)/d(F-T) = \frac{(1-\beta)sx}{x_1[(1-\beta)(q-b+s(T-F))]+\beta kx_2(v/u)^2}$$

Since we assumed in Section 2 that $q-b>s(F-T)$, the condition always holds. This outcome is shown in Figure 3.

<u>Result 3</u>: <u>The effect of an increase in s is greater, the greater is (F-T)</u>

To demonstrate that $d(u/v)/ds$ is increasing in $(F-T)$ (or that $d(u/v)/d(F-T)$ is increasing in s) it is necessary to sign $d^2(u/v)/d(F-T)ds$. Differentiating (19) with respect to s (e.g., Loomis 1975, pp.241-245) yields

$$(1-\beta)(x+sx_1 d(u/v)/ds)\left\{x_1[(1-\beta)(q-b+s(T-F))-\beta k(v/u)] + \beta kx(v/u)^2\right\}^{-1}$$

$$- x(1-\beta)s\left\{x_1[(1-\beta)(q-b+s(T-F))-\beta k(v/u)]+\beta kx(v/u)^2\right\}^{-2} \times$$

$$\left\{x_{11}[(1-\beta)(q-b+s(T-F))-\beta k(v/u)][d(u/v)/ds]\right.$$

$$\left. - (1-\beta)(F-T)x_1 - 2\beta k(v/u)^3(x-x_1 u/v)[d(u/v)/ds]\right\}$$

Since $d(u/v)/ds>0$, $x-x_1u/v=x_2>0$, and $(F-T)\geq 0$, the above expression will be positive as long as $k(v/u)<q-b+s(T-F)$, which we require for the firm to have positive value from a match. Thus the effect on u/v (and equilibrium unemployment) of an increase in s is more positive, the larger is (F-T).

4. <u>Concluding Remarks</u>

European unemployment is often blamed on institutions which make firing difficult. Emerson (1988) among others has summarized significant differences in hiring and firing laws between Europe and the United States. In this note we have attempted to analyze the "common sense" notion that firing rules and severance benefits affect firms and workers equilibrium behavior. By choosing a simple model with analytical tractability, we have avoided some of the problems associated with numerical simulation of more sophisticated stochastic environments (see for example Bentolila and Bertola 1988).

The most important lesson of this note is the asymmetry with respect the costs born by the firms and the benefits received by the workers drives the effects of firing costs and severance benefits. In the absence of asymmetry there are no effects on unemployment and vacancies in equilibrium; otherwise, (F-T) is like a tax on firms for firing, with clear public finance implications similar to those drawn by Pissarides (1985). Moral hazard problems notwithstanding, there may be strong justification to relieve the burden of (F-T), explaining sometimes-observed government policies of subsidizing severance bonuses (UK) as well as firms' relocation of workers (Japan and Sweden). Conversely, a simple reduction in the severance benfit paid by the firm ($dT=dF<0$) will have no effect on u, v, or the equilibrium wage.

This result is consistent with the recent EC Survey on Employment and Labour Markets 1985-86, in which firms considered lack of flexibility in firing to be more important for employment than the level of severance benefits.

Second, in economies with increasing structural change (s rising), one would expect to see an increase in the equilibrium rate of unemployment and a decline in the vacancies/unemployment ratio. In those economies in which there are strict regulations of firing and if these costs of firing are born asymmetrically by the firm, increased pace of structural change will lead to higher equilibrium unemployment rates.[8] Notice requirements and legal "red tape" imposed externally on the firm which do not benefit the worker directly cannot be fully recouped in the bargained wage.

Finally, it should be noted that the pace of structural change in many industrialized countries has quickened in the past fifteen years. Table 1, which displays a rising inflows into unemployment, is evidence of a rising separation rate, even in the US; Table 2 shows a similar increase in bankruptcies per employee in all countries. This phenomenon may be associated with the rise of the service economy, the increasingly small size of enterprises, or higher volatility in the employment relationship.

There are several shortcomings of the above analysis. First, treating separations as exogenous in the model is somewhat

unsatisfactory. On the other hand, certain aspects of structural change described above may be plausibly taken as given to the economy. Second., wages in reality may be set or strongly influenced by unions and other institutions. If this is the case, the wage may not necessarily reflect all gains accruing to both parties in the match. Finally, by assuming constant returns--which drives several of the results obtained above-- we rule out multiple equilibria, the possibility of which has stimulated much interest in the European unemployment problem.[9]

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Table 1

Inflows into Unemployment per Employee

	1965-69	1970-74	1975-79	1980-84	85-86	87
UK	1.27	1.38	1.69	1.91	1.98	NA
France	0.45	0.63	1.04	1.32	1.58	1.64
Germany	0.63	0.57	1.03	1.14	1.21	1.20
US	2.15	2.81	3.20	3.50	3.24	2.93

Monthly inflow rates as a percentage of total employment, except for UK (males only)

Source: Burda and Wyplosz (1989)

Table 2

Bankruptcies

Rates per 100,000 employees

	1969	1970-74	1975-79	1980-84	85-86	87
UK	NA	57	100	223	295	240
France	164	173	183	250	320	361
Germany	36	49	87	135	183	169
US	117	121	94	268	545	543

Source: Burda and Wyplosz (1989)

Endnotes

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[1] This is a fairly common assumption; for one set of conditions that generate such a function see Hall (1979). There is new evidence that this function is empirically quite stable (Blanchard and Diamond 1989).

[2] In this paper all income is measured in real terms.

[3] In principle one could allow bargaining over (θ,T) as well as w. In order to capture the effects of labor market regulation, we assume here that the terms are externally imposed on the parties.

[4] This is similar to the so-called "entitlement effect" associated with unemployment benefits.

[5] In fact, when θ=0, it is identical to equation (20) found in Pissarides (1985). Note also that equilibrium unemployment and vacancies are independent of θ, the fraction of the previous wage paid upon severance.

[6] We have also exploited the constant returns property of x.

[7] Note that if F<T the condition may still hold, but this depends on k as well as equilibrium values of endogenous variables.

[8] As noted above, this result holds even in the absence of severance benfits and firing costs.

[9] At least for the UK (Pissarides 1986) and the US (Blanchard and Diamond 1989), investigators have been unable to reject constant returns to the matching function.

Figure 1

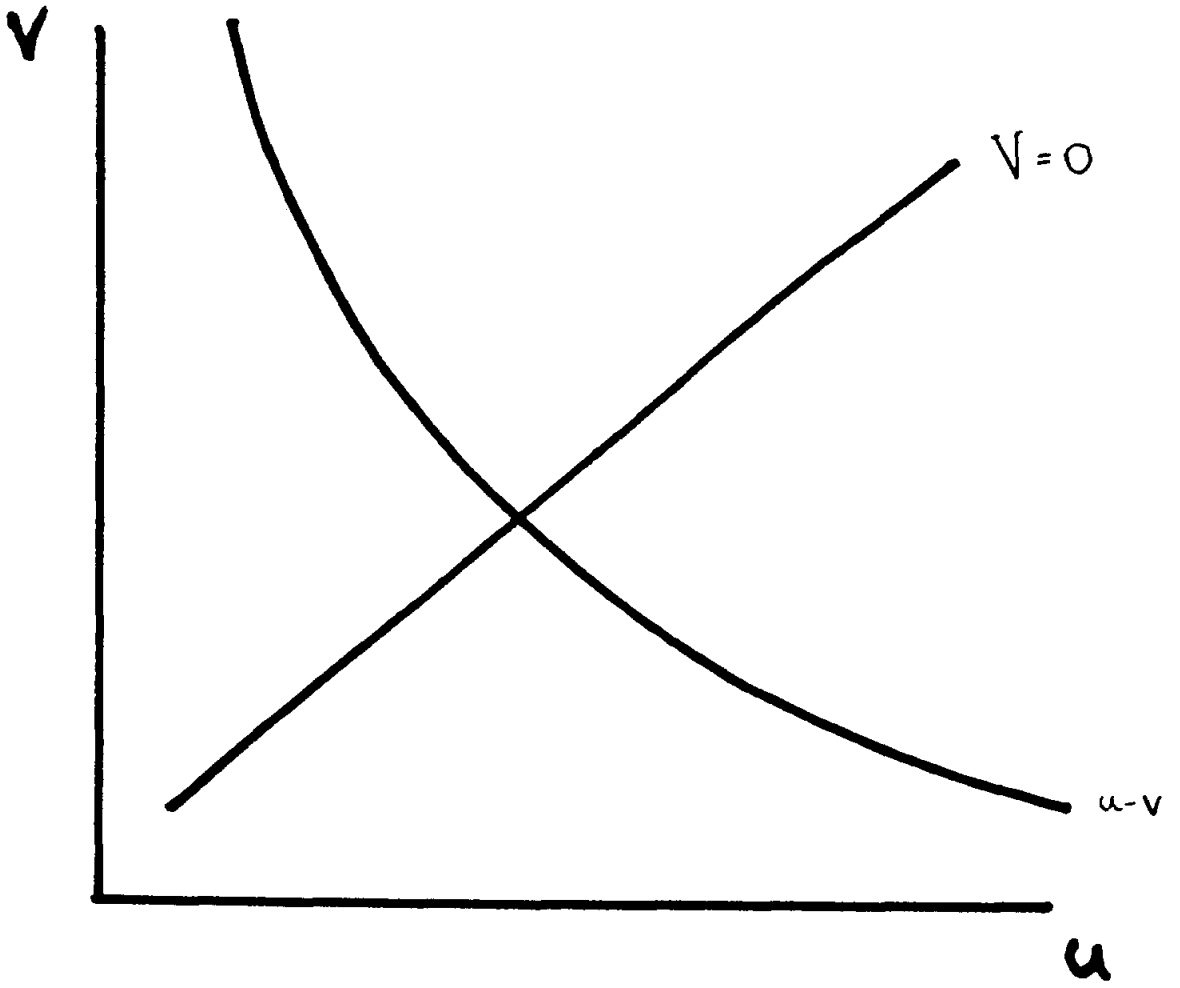


Figure 2

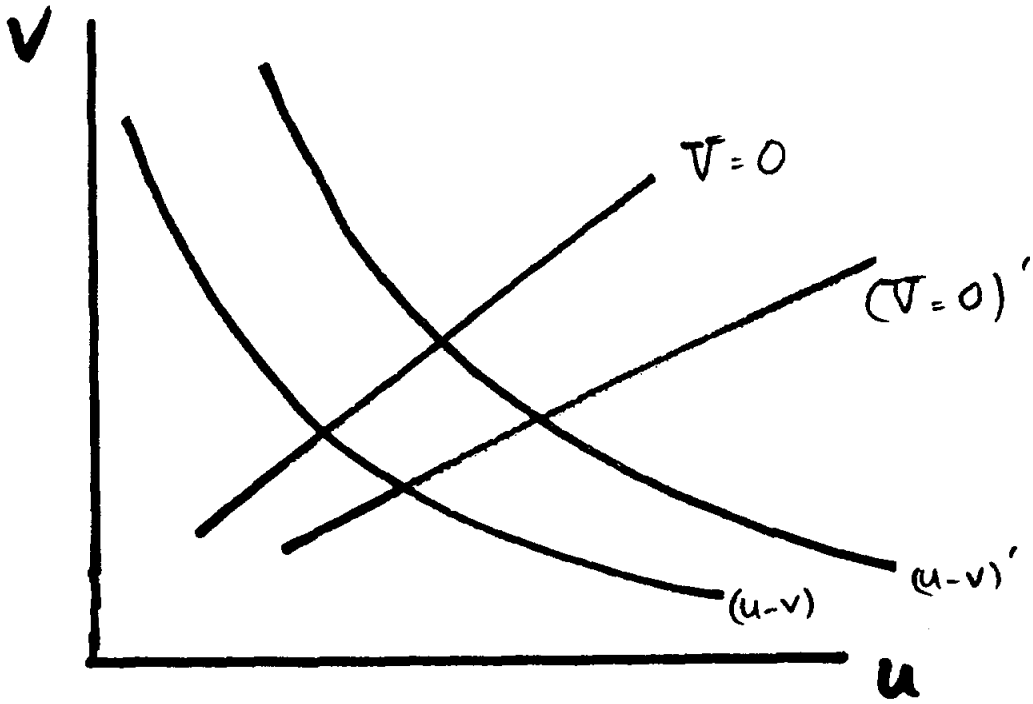
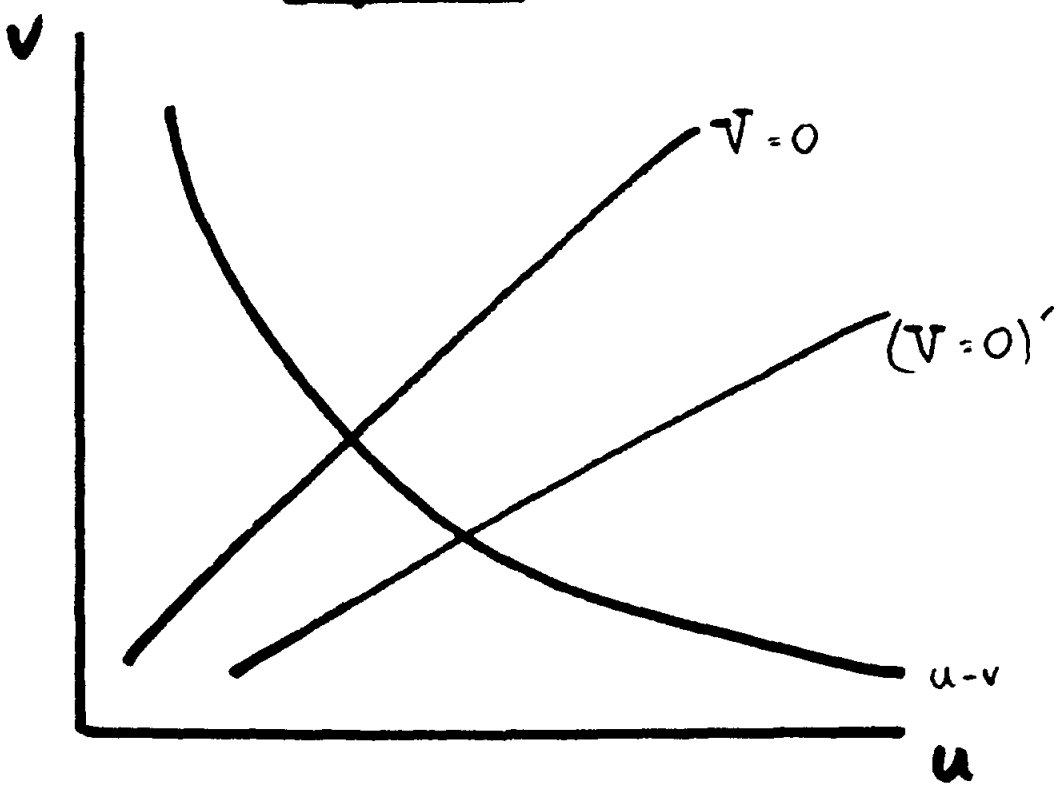


Figure 3



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