WHY ARE THERE MOBILITY RESTRICTIONS?

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ABSTRACT

Mo ility r stri tions (.g., s v r n p ym nt, lif -long t nur , n ivor n) r wi ly o s rv . This p p r is n tt mpt to un rst n why th r r th s r stri tions. I pr s nt mo l onomy th t f tur s pro u tion t ms n fo us s on th s r h for p rtn rs n th form tion n r k-up of t ms. Un r no r stri tions, th r is too mu h s r hing n r king-up us th in ivi u l ision pro l m ignor s th loss of th s rt p rtn r's utility. Arr ng m nts su h s r k-up p ym nt n r k-up n n improv w lf r . Thus th p p r r tion liz s mo ility r stri tions s w lf r -improving rr ng m nts.

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Key words: mo ility r stri tion; pro u tion t m; s r h; r k-up

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1. INTRODUCTION

Mo ility r stri tions su h s s v r n p ym nt n lif -long t nur in th l or m r-k t h v signifi nt ff t on ggr g t onomi tivity. Th high un mploym nt in Europ , in omp rison to th US, h s long n ttri ut to r gul tions r stri ting l or mo ility. L z r (1990) fin s th t s v r n p ym nts r u mploym nt in his mi-n tion of Europ n t . Hop nh yn n Rog rson (1993) r port simil r fin ing in li r t g n r l quili rium mo l. Th uthors furth r r port signifi nt n g tiv w lf r ff t of firing osts.[1] Th s fin ings l m to qu stion why th r r th s mo ility r stri tions: if th y r so , why o w o s rv th m? Mo ility r stri tions r lso wi ly foun in th m rri g m rk t. Divor p ym nts r ommon n ir t ivor ns r wi ly o s rv in v loping ountri s n in th history of v lop ountri s. Anoth r mpl of mo ility r stri tion is in usin ss p rtn rship. For m-pl , th J p n s usin ss n twork, *keiretsu*, works un r th impli it un rst n ing th t h firm woul o lig to st y in th n twork (s Fukuy m 1996). On m y rgu th t th s r stri tions l to in ffi i nt m t hing n thus r u w lf r , onomi or oth rwis . Th n g in, why o w o s rv th s r stri tions? This is th qu stion th t I r ss in this p p r.

On r son why th r r mo ility r stri tions m y th t th p opl who g in y h ving th s r stri tions som how h v th pow r to h v th ir w y. Thus th work rs' unions r oft n l m for imposing firing r stri tions. In this v in, S int-P ul (1997) rgu s th t th mploy r politi lly strong nough to r t mploym nt-prot tion l g-isl tion in Europ . Although this rgum nt h s n intuitiv pp l, it lso h s r w k. Impli it in th rgum nt is th t th r stri tions h v ov r ll n g tiv w lf r ff t ut

[1] There is ambiguity about the employment effect of firing costs. Bentolila and Bertola (1990) and Alvarez and Veracierto (1999) report positive effect using calibrated models. See Ljungqvist (1999) for a good evaluation of the literature on this issue. To my knowledge, however, all researchers report, if any, negative welfare effect of firing costs.

th t th y r n unfortun t out om giv n politi l n institution l onstr ints. Th r-gum nt th n n s n pl n tion s to why th r is not omp ns tion s h m wh r y th g in rs (firms or un mploy work rs) from r moving th r stri tions omp ns t th los rs (mploy work rs) so th t v ry o y om s tt r off. Su h n pl n tion h s not n w ll rti ul t y t (s Ro rik 1996). In this p p r, I t k iff r nt, p rh ps simpl r, ppro h to un rst n ing mo ility r stri tions th t o s without su h r w-k: I plor how th r stri tions m y improv ov r ll w lf r , th r y justifying th ir pr s n .

Th si story is s follows. Im gin two p opl in p rtn rship. Suppos on of th m m t n lt rn tiv p rtn r. If h r ks up with his urr nt p rtn r n forms n w p rtn rship with th lt rn tiv p rtn r, this s rt p rtn r suff rs w lf r loss. How v r, without ny r stri tions on r k-up, th w lf r loss of th s rt p rtn r is t rn l to th ision pro l m of th s rting p rtn r. Du to this t rn lity, th p rtn rship r ks up too sily n furth r th r is too mu h s r h for n lt rn tiv p rtn r sin m ting n lt rn tiv p rtn r is ov r-v lu . In this situ tion, r k-up r stri tions su h s r k-up p ym nt n r k-up n n improv th joint w lf r of th p rtn rs y int rn lizing (som of) th t rn lity.

Th l m nts of th story r not n w. Th i th t s v r n p ym nt m y improv w lf r is is rn l in th impli it ontr t th ory (s , for mpl , Arnott, Hosios, n Stiglitz 1988). Th fo us of th t th ory, how v r, is on th issu s of w g rigi ity n involunt ry un mploym nt. Furth r, th riving for hin th impli it ontr t is th n to insur risk- v rs work rs g inst n g tiv sho ks, on whi h th ov story o s not p n . In t rms of mo ling, th story is sily pl in th fr m work of th s r h n m t hing th ory. In th t th ory, v rious typ s of t rn lity h v n r ogniz n plor .[2] How v r, th p rti ul r t rn lity pr s nt in th ov story h s not n plor to my knowl g .[3]

B for pro ing to th mo l, I will m k som qu lifi tions so th t I on't ov rs ll th story unwittingly. First, th mo l is k pt t quit str t l v l. For inst n , th mo l o s not f tur - nt symm try tw n urr nt p rtn rs, pr s nt tw n th firm n work r or tw n th m n n wom n. I r ogniz th t mo ling su h symm try is import nt if I will li r t th mo l n plor th qu ntit tiv impli tions in th l or or m rri g m rk ts. How v r, I think th t th n tur of s r h n r k-up in th l or n m rri g m rk ts is simil r nough to th t in symm tri p rtn rship (.g., usin ss p rtn rship, fri n ship) so th t w n gr sp th m in rgum nt of th story t th m int in l v l of str tion without s rifi ing its ppli ility in v rious ont ts. S on , I o not l im th t th mo l ptur s th sol r son for mo ility r stri tions. R th r, I vi w th r son onsi r h r s ompl m nting th oth rs, su h s th on s on politi l onomy. Thir , th mo l o s not pl in ross- ountry or ross-p rio iff r n s in mo ility r stri tions. Thus th mo l o s not nsw r why th Europ n l or m rk t h s mor r stri tions th n th US m rk t or why th ivor n w s lift in th 70's in It ly n Br zil. Th mo l, how v r, o s provi r son why th r *may* mo ility r stri tions n thus, I think, is st p forw r in un rst n ing th ir v ri tions ross ountri s n p rio s.

Th r m in r of th p p r is org niz s follows. In S tion 2, I pr s nt mo l of s r h n r k-up th t form liz s th ov story. For th n rr tiv purpos , I onsi r thr onomi s th t sh r th s m nvironm nt pt with r sp t to th r k-up r stri tion. Th n hm rk onomy h s no r stri tions n ons qu ntly th r is too mu h s r h n r k-up. Th s on onomy r stri ts r k-up y r quiring

[2] See Hosios (1990) and the references therein.

[3] See Burdett and Coles (1999) for a standard formalization of partnership formation. The main difference of the model in this paper is that partnerships can be voluntarily broken, which gives rise to the above-mentioned externality.

th s rting p rtn r to p y th s rt p rtn r in th mount qu l to th w lf r loss of th s rt p rtn r. This r k-up p ym nt rr ng m nt hi v s th optim l l v ls of s r h n r k-up. Th thir onomy r stri ts r k-up y ir t r k-up n p n ing on urr nt p rtn rs' omp ti ility. Although this r k-up n rr ng m nt o s not hi v optim lity, it improv s w lf r on th n hm rk onomy. In S tion 3, I is uss som furth r impli tions n int rpr t tions of th mo l. In S tion 4, I on lu y v lu ting th m rits n short omings of th mo l.

2. A MODEL ECONOMY OF SEARCH AND BREAK-UP

In this s tion, I will form liz th v lu of mo ility r stri tions y omp ring thr onomi s th t f tur s r h n r k-up n iff r in t rms of r k-up r stri tions. But, first, I will l y out th ommon nvironm nt of th s onomi s. Th r r m ny p opl . Ev ryon 's on -p rio utility is $c-x$, wh r c is onsumption n x is s r h ffort or s r h ost. Ev ryon is ounts futur onsumption n s r h osts y on -p rio is ount r t β. At th ginning of h p rio , p rson is ith r lon , or p rtn r of two-p rson pro u tion t m. Th first v nt of th p rio is th t p opl work to pro u output. A p rson working lon pro u s y_1 units of output. Th output of t m p n s on how omp ti l th two p rtn rs r . L t $y \in [y_1, y_2]$, wh r $y_1, y_2 > 0$, not th omp ti ility of th p rtn rs. A t m with omp ti ility y pro u s $2y$ units of output. P rtn rs ivi output qu lly so th t h p rtn r t k s y units of output. Th qu l ivision of th output is n tur l ssumption sin , s will is uss low, th two p rtn rs' s r h n m t hing prosp ts r i nti l n thus th y r in qu l rg ining positions.

Aft r pro u tion, p opl s r h for n w p rtn rs. Th s r h n m t hing t hnology is s follows. A p rson p n ing x units of s r h ost m ts pot nti l p rtn r with pro ility $m(x)$, th t s tisfi s $m(0) = 0$ n for ll $x \geq 0$, $m'(x) > 0$ n $m''(x) < 0$. Th on vity of th fun tion m nsur s th t th quili rium s r h l v l for th p rtn rs of ny pro u tion t m is int rior n uniqu . Th omp ti ility of ny two p opl who m t is r n om n istri ut y th fun tion $F(y)$. Impli it hin this is th ssumption th t lthough p rson A n p rson B iff r in t rms of th ir omp ti ility with p rson C, th p ir-wis omp ti ility is i iosyn r ti n v ryon is i nti l in t rms of th - nt istri ution of omp ti ility.

To fo us th n lysis on th issu s of oor in tion tw n urr nt p rtn rs, I will m k two simplifying ssumptions. First, for ny urr nt t m it n v r h pp ns th t oth of th two p rtn rs m t lt rn tiv p rtn rs: ith r on of th two m m rs m ts n lt rn tiv p rtn r or n ith r o s. This will ppro im t ly th s if th l ngth of p rio is sm ll v n if th s r h out om s of th two urr nt p rtn rs r in p n nt of h oth r: th pro ility of th two urr nt p rtn rs oth m ting pot nti l p rtn rs n ssum w y.[4] To onsist nt with this ssumption, ssum th t for ll $x \geq 0$, $m(x) < 1/2$. S on , if p rson whos omp ti ility with his urr nt p rtn r is y m ts n lt rn tiv p rtn r, this lt rn tiv p rtn r's omp ti ility with *his* urr nt p rtn r is lso y. Simil rly, p rson without t m m ts only p rson without t m. Without this ssumption, p rson's s r h h s n t rn lity on th oth r s r h rs y ff ting th istri ution of s r h rs: th s r h of p rson with low urr nt output h s positiv t rn lity on th oth r s r h rs sin h woul mor willing to form n w t m; onv rs ly, th s r h of p rson with high urr nt output h s n g tiv t rn lity. Thus this ssumption llows th n lysis to str t w y from th ompli tion r sulting from this typ of t rn lity n to fo us on th t rn lity pr s nt tw n urr nt p rtn rs. To on ptu liz th institution l rr ng m nt onsist nt with this ssumption, suppos th t th urr nt output is o s rv l to v ryon n th r is ostl ss t hnology th t ir ts p opl to v rious s r h n m t hing r s p n ing on th ir urr nt output.

[4] This assumption is implicit in continuous-time models, which are obtained in the limit of shortening the length of period. See Burdett and Coles (1999).

Aft r s r hing n m t hing, p rson who m t n lt rn tiv p rtn r i s wh th r to form n w t m with th lt rn tiv p rtn r or to st y with th urr nt p rtn r, t king s giv n ny r k-up r stri tion. Not th t, giv n th ssum s r h n m t hing t hnology, two n wly-m t p opl r i nti l in t rms of th omp ti ility with th ir r sp tiv urr nt p rtn rs n th ir futur prosp ts. Thus th ir r k-up ision will th s m : ith r th y oth w nt to form n w t m with h oth r or n ith r w nts to. This simplifi s th n lysis gr tly. Aft r th t ms h v n form , rok n up, or pr s rv , p opl onsum th ir sh r of urr nt output, n t of ny r k-up p ym nt. Fin lly, t th n of th p rio δ fr tion of ll (n w n ol) t ms r r n- omly rok n up. Th og nous r k-up is simpl w y of g n r ting non- iminishing s r h n r k-up tiviti s in th long-run.

In this nvironm nt, p rson's k y isions t h t is how mu h to s r h n , if h m ts n lt rn tiv p rtn r, wh th r to form n w t m. Import nt in th p rson's ision pro l m is wh t onstr ints h f s in oor in ting th s r h n th r k-up with his urr nt p rtn r. In th following, I will onsi r thr onomi s th t iff r in this r sp t.

2.1 E onomy 1: No R stri tion

As n hm rk s , l t us first onsi r n onomy wh r s r h n r k-up r not oor in t tw n urr nt p rtn rs: for s r h th y nnot jointly ommit to s r h or r k-up rul nor n th y n goti t ft r m ting n lt rn tiv p rtn r. This nvironm nt, lthough m nt to ptur th tr m s for th n rr tiv purpos , h s som r lism. First, ommitting to rul is iffi ult in m ny ir umst n s: p rson's s r h l v l m y iffi ult for his p rtn r to o s rv n in ny s nfor ing rul on n (-post) unwilling p rtn r is not sy. S on , p opl m y not h v nough m ns of p ym nt ith r for honoring rul or for -post n goti tion: th urr nt in om m y sm ll r l tiv to th p ym nt n th r it m rk t m y un r v lop .

To form liz p rson's ision pro l m in this onomy, l t $v(y)$ th p t is ount utility of p rson with th urr nt output y. Th B llm n's qu tion is

$$
\begin{aligned}
v(y) = \mathop{\mathrm{m}}_{x,g} \Big\{ & y - x + \beta(1-\delta)m(x) \int_{y_1}^{y_2} g(y')v(y')dF(y') \\
& + \beta(1-\delta)[1 - m(x) \int_{y_1}^{y_2} g(y')dF(y') - \phi(y)]v(y) \\
& + \beta[\delta + (1-\delta)\phi(y)]v(y_1) \Big\}.
\end{aligned} \tag{1}
$$

In this qu tion, $g(y')$ is th r k-up ision m upon m ting n lt rn tiv p rtn r whos omp ti ility is y' ($g(y') = 1$ if n w t m is form n th urr nt t m is rok n up n $g(y') = 0$ if not) n $\phi(y)$ is th pro ility of ing s rt y th urr nt p rtn r. Th p rson t k s this pro ility s giv n sin th r is no oor in tion tw n p rtn rs. L t $x(y)$ n $g(y, y')$ not th s r h n r k-up fun tions sso i t with th B llm n's qu tion. Sin th urr nt p rtn rs of t m solv th s m ision pro l m, in quili rium th pro ility for p rson to l v his p rtn r will th s m s th pro ility for his p rtn r to l v him. Thus w h v

$$
\phi(y) = m(x(y)) \int_{y_1}^{y_2} g(y, y')dF(y'). \tag{2}
$$

An quili rium of this onomy is v lu fun tion $v(y)$, s r h fun tion $x(y)$, r k-up fun tion $g(y, y')$, n r k-up pro ility fun tion $\phi(y)$ th t s tisfy qu tions 1 n 2. Th following proposition h r t riz s th quili rium.

Proposition 1. There is a unique equilibrium of Economy 1 with the following properties. For all y, v is continuous and increasing; x is decreasing; ϕ is decreasing; $g(y, y') = 0$ if $y' \leq y$; and $g(y, y') = 1$ if $y' > y$.

Proof: L t T n op r tor th t m ps w to $T(w)$ s follows:

$$
\begin{aligned}
T(w)(y) = \mathop{\mathrm{m}}_{x,g(\cdot)} \Big\{ & y - x + \beta(1-\delta)m(x) \int_{y_1}^{y_2} g(y')w(y')dF(y') \\
& + \beta(1-\delta)[1 - m(x) \int_{y_1}^{y_2} g(y')dF(y') - \phi_w(y; w)]w(y) \\
& + \beta[\delta + (1-\delta)\phi_w(y; w)]w(y_1) \Big\},
\end{aligned} \tag{3}
$$

wh r

$$\phi_w(y;w) = m(x_w(y;w)) \int_{y_1}^{y_2} g_w(y, y'; w) dF(y'). \tag{4}$$

In this qu tion, x_w n g_w r th solution to th m imiz tion pro l m in qu tion 3. W n show th t if w is oun , $T(w)$ is oun ; for ny oun w n w', if $w(y) \geq w'(y)$, $T(w)(y) \geq T(w')(y)$; n for ny oun w n ny onst nt c, $T(w+c) \leq T(w) + \beta c$. Thus T s tisfi s th Bl kw ll's on ition n is ontr tion m pping. Now suppos w is ontinuous n non- r sing. W h v $g_w(y, y'; w) = 0$ if $y' \leq y$ n $g_w(y, y'; w) = 1$ if $y' > y$ (imposing th ut-off onv ntion wh n g_w n t k on ith r v lu). Giv n th ssumptions on m, $x_w(y;w)$ is uniqu n non-in r sing n ontinuous. Th n $\phi_w(y;w)$ is ontinuous n r sing. Using th s prop rti s of g_w, x_w, n ϕ_w, w n show th t T(w)(y) is ontinuous n in r sing in y. Thus y th Contr tion M pping Th or m, th r is uniqu oun , ontinuous, n non- r sing v th t solv s qu tions 1 n 2 n furth r, v is in r sing. R p ting th ov st ps involv in riving th prop rti s of g_w, x_w, n ϕ_w, w h v th st t prop rti s of g, x, n ϕ. Q.E.D.

To un rst n this proposition intuitiv ly, p rson is tt r off with tt r urr nt m t h (gr t r urr nt output). If p rson m ts n lt rn tiv p rtn r, h forms n w t m if h is mor omp ti l with th lt rn tiv p rtn r th n with th urr nt on , n h st ys with th urr nt p rtn r oth rwis . Giv n this ut-off rul on t m form tion n r k-up, th low r urr nt output p rson h s, th mor lik ly th p rson will form n w t m with n lt rn tiv p rtn r. Thus m ting n lt rn tiv p rtn r is mor v lu l to p rson with low r urr nt output n ons qu ntly h will s r h mor . Du to gr t r s r h n low r ut-off omp ti ility for r k-up, p rson with low r urr nt output is mor lik ly to r k up (or s rt).

In this onomy, th quili rium s r h n r k-up h vior is su -optim l: so i l pl nn r n in r s w lf r y i t ting iff r nt s r h n r k-up h vior. To s this, l t us onsi r th so i l pl nn r's pro l m. Not th t th s r h n m t hing t hnology is su h th t th r is no s op for th so i l pl nn r to tr th joint utility (i. ., th for -s r h p t utility) of p ir of urr nt p rtn rs with th t of noth r. Thus th so i l pl nn r's pro l m is to m imiz th joint utility of h p ir of urr nt p rtn rs. L t $v(y)$ th p t is ount utility of p rson with th urr nt output y un r th pl nn r's i t tion. Th B llm n's qu tion sso i t with th pl nn r's pro l m is

$$
\begin{aligned}
v(y) = \underset{x,g}{\mathrm{m}} \{y - x + \beta(1-\delta)m(x)\int_{y_1}^{y_2} g(y')v(y')dF(y') \\
+ \beta(1-\delta)[1 - 2m(x)\int_{y_1}^{y_2} g(y')dF(y')]v(y) \\
+ \beta[\delta + (1-\delta)m(x)\int_{y_1}^{y_2} g(y')dF(y')]v(y_1)\}
\end{aligned}
\tag{5}
$$

n th orr spon ing pro ility of r k-up is

$$
\phi(y) = m(x(y))\int_{y_1}^{y_2} g(y, y')dF(y') \tag{6}
$$

wh r x n g r th s r h n r k-up fun tions sso i t with qu tion 5. Th iff r n tw n p rson's ision pro l m (qu tion 1) n th pl nn r's ision pro l m (qu tion 5) is th t th loss of th s rt p rtn r's utility is t rn l to th form r wh r s it is int rn l to th l tt r. Th optimum of this onomy is v lu fun tion $v(y)$, s r h fun tion $x(y)$, r k-up fun tion $g(y, y')$, n r k-up pro ility fun tion $\phi(y)$ th t s tisfy qu tions 5 n 6. Th following proposition h r t riz s th optimum.

Proposition 2. The optimum has the following properties: v is continuous and increasing for all y; there is $y \in (y_1, y_2)$ such that x and ϕ are decreasing if $y < y$ and $x(y) = \phi(y) = 0$ if $y \geq y$; $g(y, y') = 0$ if $y' \leq \gamma(y)$ and $g(y, y') = 1$ for $y' > \gamma(y)$ where $\gamma(y) = \mathrm{m}\ \{y' : v(y') - v(y) \leq v(y) - v(y_1)\}$.

Proof: L t T n op r tor th t m ps w to $T(w)$ or ing to th right-h n si of qu tion 5. W n show th t T pr s rv s oun n ss n ontinuity n s tisfi s th Bl kw ll's on itions of monotoni ity n is ounting. (S th proof of Proposition 1.) Thus T is ontr tion n th r is uniqu oun n ontinuous v th t solv s qu tion 5. Furth r, w n show th t if w is non- r sing, $T(w)$ is in r sing. Thus v is in r sing. Using this, w n riv th st t prop rti s of g, x, n ϕ. Q.E.D.

Th optim l r k-up h vior f tur s ut-off l v l of omp ti ility th t is high r th n th urr nt l v l us th r k-up is llow only wh n th urr nt p rtn rs' joint utility g in s th ir joint utility loss. Th optim l s r h l v l is s t so th t th m rgin l s r h ost is qu l to th p t joint utility g in from th gr t r l v l of s r h, n t of th p t joint utility loss. In quili rium, on th oth r h n , p rson r ks up with his urr nt p rtn r s long s his utility g in is positiv , ignoring th utility loss of his urr nt p rtn r. Du to this t rn lity, t ms r too sily rok n up. Furth r, sin p rson only r s out his utility g in, m ting pot nti l p rtn r is ov r-v lu n th r for th r is too mu h s r hing s w ll.[5] Th following proposition summ riz s th is ussion:

Proposition 3. The equilibrium of Economy 1 is sub-optimal: $v(y) > v(y)$ for all y.

Proof: L t v th quili rium v lu fun tion n T th op r tor in th proof of Proposition 2. Comp ring qu tions 3 n 5, w n show th t $T(v)(y) \geq v(y)$ with stri t in qu lity pt for $y = y_1, y_2$. Using this n th monotoni ity of T, w n show th t $T(T(v))(y) \geq v(y)$ with stri t in qu lity pt for $y = y_2$. Using this, w n in turn show th t $T(T(T(v)))(y) > v(y)$ for ll y. Giv n th t T is ontr tion, this impli s th st t in qu lity. Q.E.D.

R ll th t in this n hm rk onomy oor in tion tw n th urr nt p rtn rs is rul out: th y nnot ommit to rul nor n th y n goti t ft r m ting n lt rn tiv p rtn r. In th r m in r of S tion 2, I will onsi r th s r h n r k-up h vior n th its ff t on w lf r wh n th s ssumptions r r l n som oor in tion is llow .

[5] The intuition that there is too much searching is in the context of the one period decision problem (i.e., fixing v). Over the infinite horizon, the externality would in general affect the 'shape' of v as well, which also affects the current search level. The direction and the size of this effect are not intuitively clear. In any case, the *aggregate* levels of search and break-up are likely to be lower under the planner's dictation. See Section 3.

2.2 E onomy 2: Br k-up P ym nt

In this onomy urr nt p rtn rs n oor in t s r h n r k-up y ommitting for s r h to r k-up p ym nt rul . Diff r nt from th n hm rk onomy is th ssumption th t p rtn rs n m k p ym nt n ommit to rul . In quili rium, this p ym nt will m y th s rting p rtn r to th s rt p rtn r in th mount qu l to th loss of th s rt p rtn r's utility. Th k y r sult is th t un r this r k-up p ym nt rr ng m nt, th optim l l v ls of s r h n r k-up r hi v .

Th urr nt p rtn rs tog th r i on th r k-up p ym nt ut sin th y r i nti l in th ir prosp ts, th y woul pr f r th s m mount of p ym nt. Thus th ision pro l m n onsi r s if it is on -si . L t $\tilde{v}(y)$ th p t is ount utility of p rson with th urr nt output y in this onomy. Th B llm n's qu tion is

$$\begin{aligned}\tilde{v}(y) = \underset{x,g,z}{\mathrm{m}} \{ & y - x + \beta(1-\delta)m(x)\int_{y_1}^{y_2} g(y')\tilde{v}(y')dF(y') \\ & + \beta(1-\delta)[1 - m(x)\int_{y_1}^{y_2} g(y')dF(y') - \phi_z(y,z)]\tilde{v}(y) \\ & + \beta[\delta + (1-\delta)\phi_z(y,z)]\tilde{v}(y_1) \\ & + z[\phi_z(y,z) - m(x)\int_{y_1}^{y_2} g(y')dF(y')]\}. \end{aligned} \tag{7}$$

In this qu tion, z is th r k-up p ym nt n $\phi_z(y,z)$ is th pro ility of ing s rt giv n z. This pro ility s tisfi s

$$\tilde{\phi}_z(y,z) = m(x_z(y,z))\int_{y_1}^{y_2} g_z(y,y',z)dF(y'), \tag{8}$$

wh r $x_z(y,z)$ n $g_z(y,y',z)$ r th solution to th right-h n si of qu tion 7, t king z s giv n. Thus in this onomy, unlik in E onomy 1, urr nt p rtn rs n ontrol h oth r's s r h n r k-up h vior in ir tly y v rying th r k-up p ym nt. An quili rium of this onomy is v lu fun tion $\tilde{v}(y)$, r k-up p ym nt fun tion $z(y)$, s r h fun tion $\tilde{x}(y)(\equiv x_z(y,z(y)))$, r k-up fun tion $\tilde{g}(y,y')(\equiv g_z(y,y',z(y)))$, n r k-up pro ility fun tion $\tilde{\phi}(y)(\equiv \phi_z(y, z(y)))$ th t s tisfy qu tions 7 n 8. Th following proposition h r t riz s th quili rium.

Proposition 4. The equilibrium of Economy 2 exists and is optimal: $\tilde{v} = v$; $\tilde{x} = x$; $\tilde{g} = g$; $\tilde{\phi} = \phi$. *Further,* $z(y) = \beta(1-\delta)(\tilde{v}(y) - \tilde{v}(y_1))$ *for all* y.

Proof: Th right-h n si of qu tion 7 is quiv l nt to

$$\text{m}_{z} \ \Big\{y - x_z(y,z) + \beta(1-\delta)m(x_z(y,z))\int_{y_1}^{y_2} g_z(y,y',z)[\tilde{v}(y') - 2\tilde{v}(y) + \tilde{v}(y_1)]dF(y') + \beta[\delta\tilde{v}(y_1) + (1-\delta)\tilde{v}(y)]\Big\}.$$

Furth r w n show th t $g_z(y,y',z) = 0$ if $\beta(1-\delta)(\tilde{v}(y') - \tilde{v}(y)) \leq z$ n $g_z(y,y',z) = 1$ if $\beta(1-\delta)(\tilde{v}(y') - \tilde{v}(y)) > z$. Th n th m imum will o ur wh n $z = \beta(1-\delta)(\tilde{v}(y) - \tilde{v}(y_1))$. Su stituting this in qu tion 7, w n show th t th m imiz tion pro l ms in qu tion 5 n 7 r th s m : th s m x n g solv oth pro l ms n th m imum is th s m for oth pro l ms. Thus th quili rium ists n s tisfi s th st t quiv l n to th optimum. From Proposition 2, w know th t $\tilde{v}$ is in r sing. R p ting th ov st ps involv in riving z th t solv s th m imiz tion pro l m, w n show th t for ll y, $z(y)$ is uniqu n s tisfi s th st t prop rty. Q.E.D.

In this onomy, th r k-up p ym nt s rv s to int rn liz th loss of th s rt p rtn r's utility so th r k-up ision is optim l. Without th t rn lity, th s r h l v l is optim l s w ll: th s r h l v l is wh r th m rgin l s r h ost of m ting pot nti l p rtn r is qu l to th v lu of m ting pot nti l p rtn r n t of th n g tiv ff t on th urr nt p rtn r.

2.3 E onomy 3: Br k-up B n

In E onomy 2, th optim l s r h n r k-up h vior r sult from th ssumption th t p opl h v th m ns to p y n n ommit to o so. Ev n if p opl o not h v th m ns to p y, th s r h n r k-up h vior woul optim l if th y n ommit to rul th t llows r k-up p n ing on th omp ti ility of th lt rn tiv p rtn r: th rul woul llow r k-up only wh n th utility g in y th s rting p rtn r is gr t r th n th utility loss y th s rt p rtn r. How v r, su h rul woul r quir th t th s rt p rtn r n o s rv th omp ti ility w n his urr nt p rtn r n *his* lt rn tiv p rtn r, n ssumption th t is not n ss ry in th r k-up p ym nt onomy. It s ms mor pl usi l to ssum oth rwis : p rson's omp ti ility with his lt rn tiv p rtn r is iffi ult for his urr nt p rtn r to o s rv .

With this motiv tion, in this su s tion l t us onsi r n onomy th t f tur s simpl r k-up n rul th t o s not p n on th omp ti ility of th lt rn tiv p rtn r. Th ssumption is th n th t, s in E onomy 2, p opl n ommit to rul for s r h ut, s in E onomy 1, p opl o not h v th m ns to p y n furth r th y o not know th urr nt p rtn r's omp ti ility with his lt rn tiv p rtn r. In quili rium th urr nt p rtn rs will hoos to n r k-up if n only if th ir output l v l (i. ., th omp ti ility tw n th m) is high r th n ut-off l v l. Th k y r sult is th t un r this r k-up n rr ng m nt, unsurprisingly, th s r h n r k-up h vior is w lf r -improving on E onomy 1 ut, unlik in E onomy 2, f lls short of th optimum.

As in E onomy 2, lthough urr nt p rtn rs tog th r i on th r k-up n, th ision pro l m n onsi r s if it is on -si sin th p rtn rs r i nti l in th ir prosp ts n thus woul pr f r th s m hoi . L t $\bar{v}(y)$ th p t is ount utility of p rson with th urr nt output y in this onomy. Th B llm n's qu tion is

$$\begin{aligned} \bar{v}(y) = \mathop{\mathrm{m}}_{x,g,h} \{ & y - x + \beta(1-\delta)m(x)\int_{y_1}^{y_2} hg(y')\bar{v}(y')dF(y') \\ & + \beta(1-\delta)[1 - m(x)\int_{y_1}^{y_2} hg(y')dF(y') - \phi_h(y,h)]\bar{v}(y) \\ & + \beta[\delta + (1-\delta)\phi_h(y,h)]\bar{v}(y_1). \end{aligned} \tag{9}$$

In this qu tion, h is th r k-up n rul ($h = 0$ if r k-up is not llow n $h = 1$ if it is) n $\phi_h(y,h)$ is th pro ility of ing s rt giv n h. This pro ility s tisfi s

$$\phi_h(y,h) = m(x_h(y,h))\int_{y_1}^{y_2} hg_h(y,y',h)dF(y') \tag{10}$$

wh r $x_h(y,h)$ n $g_h(y,y',h)$ r th solution to th right-h n si of qu tion 9, t king h s giv n. An quili rium of this onomy is v lu fun tion $\bar{v}(y)$, r k-up n fun tion $h(y)$, s r h fun tion $\bar{x}(y)(\equiv x_h(y,h(y)))$, r k-up fun tion $\bar{g}(y,y')(\equiv g_h(y,h(y)))$, n r k-up pro ility fun tion $\bar{\phi}(y)(\equiv \phi_h(y,h(y))$ th t s tisfy qu tions 9 n 10. Th following proposition h r t riz s th quili rium.

Proposition 5. There is a unique equilibrium of Economy 3 with the following properties. For all y, $\bar{v}$ is continuous and increasing; there is $\bar{y} \in (y_1, y_2)$ such that $h(y) = 1$ if $y < \bar{y}$ and $h(y) = 0$ if $y \geq \bar{y}$; $\bar{x}$ and $\bar{\phi}$ are decreasing if $y < \bar{y}$ and $\bar{x}(y) = \bar{\phi}(y) = 0$ if $y \geq y$. For $y < \bar{y}$, $\bar{g}(y,y') = 0$ if $y' \leq y$ and $\bar{g}(y,y') = 1$ if $y' > y$.

Proof: L t $\bar{T}$ n op r tor th t m ps w to $\bar{T}(w)$ s follows:

$$\begin{aligned}\bar{T}(w)(y) = \operatorname*{m}_{x,g,h} \{ & y - x + \beta(1-\delta)m(x)\int_{y_1}^{y_2} hg(y')w(y')dF(y') \\ & + \beta(1-\delta)[1 - m(x)\int_{y_1}^{y_2} hg(y')dF(y') - \phi_{hw}(y,h;w)]w(y) \\ & + \beta[\delta + (1-\delta)\phi_{hw}(y,h;w)]w(y_1)\},\end{aligned} \tag{11}$$

wh r

$$\phi_{hw}(y,h;w) = m(x_{hw}(y,h;w))\int_{y_1}^{y_2} g_{hw}(y,y',h;w)dF(y'). \tag{12}$$

In this qu tion, x_{hw} n g_{hw} r th solution to th m imiz tion pro l m in qu tion 11. W n show th t T pr s rv s oun n ss n s tisfi s th Bl kw ll's on itions of monotoni ity n is ounting. (S th proof of Proposition 1.) Thus $\bar{T}$ is ontr tion. Now suppos w is ontinuous n non- r sing. Equ tion 11 n r writt n s

$$\bar{T}(w)(y) = \operatorname*{m}_{h} \{\bar{T}(w;h)(y)\} \tag{13}$$

wh r $\bar{T}(w;h)(y)$ is th m imum t king h s giv n. W n show th t for ny y, $\bar{T}(w;0)$ is ontinuous n in r sing. Also, w h v $\bar{T}(w;1) = T(w)$ n thus $\bar{T}(w;1)$ is ontinuous n in r sing. (S th proof of Proposition 1.) Th n $\bar{T}(w)$ is ontinuous n in r sing. Thus th r is uniqu oun , ontinuous, n non- r sing $\bar{v}$ th t solv s qu tions 9 n 10 n furth r, $\bar{v}$ is in r sing. Now y omp ring $\bar{T}(\bar{v};0)$ n $\bar{T}(\bar{v};1)$, w n show th t for ny y, $h = 0$ if n only if $\int_y^{y_2}[\bar{v}(y') - 2\bar{v}(y) - \bar{v}(y_1)]dF(y') \leq 0$. Sin $\bar{v}$ is in r sing, th r is ut-off $\bar{y}$ s s ri in th proposition. Giv n this ut-off rul n using th t $\bar{v}$ is in r sing, w n show th st t prop rti s of $\bar{x}$, $\bar{g}$, n $\bar{\phi}$. Q.E.D.

In oth r wor s, th r is ut-off output l v l so th t p rtn rs with output gr t r th n th ut-off l v l hoos to n r k-up. Cons qu ntly th y o not s r h t ll n thus n v r r k up pt in th s of og nous sho k. This is us ov this ut-off l v l, th p t utility g in from s r hing for tt r m t h is sm ll r th n th p t utility loss of th woul - - s rt p rtn r. For p rtn rs with output l ss th n th ut-off l v l, how v r, th joint utility is gr t r with s r hing n m t hing. Thus th y hoos to llow r k-up n to s r h n m t h without r str int s in E onomy 1.

Giv n th simpli ity of th r k-up n rul (i. ., th t it o s not p n on th omp ti ility of th lt rn tiv p rtn r), th quili rium s r h n r k-up h vior woul su -optim l. How v r, th rul shoul liv r gr t r w lf r th n th no-rul rr ng m nt of E onomy 1: intuitiv ly, th rul n only l to gr t r w lf r us urr nt p rtn rs h v th option to s r h n m t h s in E onomy 1 y llowing r k-up. Thus w h v th following proposition.

Proposition 6. The equilibrium of Economy 3 is sub-optimal but welfare-improving on the equilibrium of Economy 1: $v(y) > \bar{v}(y) > v(y)$ *for all* y.

Proof: L t T n $\bar{T}$ th op r tor in th proofs of Propositions 2 n 5. Comp ring qu tions 5 n 11, w n show th t $T(\bar{v})(y) \geq \bar{v}(y)$ for ll y with stri t in qu lity for $y \in (y_1, \bar{y})$. Using this n th monotoni ity of T, w n show th t $T(T(\bar{v}))(y) \geq v(y)$ for ll y with stri t in qu lity for $y \in [y_1, \bar{y})$. Using this, w n in turn show th t $T(T(T(\bar{v})))(y) > v(y)$ for ll y. Giv n th t T is ontr tion, this impli s th t $v(y) > \bar{v}(y)$ for ll y. Now l t v th quili rium v lu fun tion for E onomy 1 n T th op r tor in th proof of Proposition 1. Comp ring qu tions 3 n 11, w n show th t th r is $\acute{y} \in (y_1, y_2)$ su h th t $\bar{T}(v)(y) \geq v(y)$ with stri t in qu lity for $y \in (\acute{y}, y_2)$. Using this n th monotoni ity of $\bar{T}$, w n show th t $\bar{T}(\bar{T}(v))(y) \geq v(y)$ with stri t in qu lity pt for $y = y_2$. Using this, w n in turn show th t $\bar{T}(\bar{T}(\bar{T}(v)))(y) > v(y)$ for ll y. Giv n th t $\bar{T}$ is ontr tion, this impli s th t $\bar{v}(y) > v(y)$ for ll y. Q.E.D.

3. FURTHER DISCUSSION ON THE MODEL ECONOMY

Th out om of th n lysis in S tion 2 n summ riz s follows. If p rson's r k-up ision h s n g tiv t rn lity to his urr nt p rtn r, r stri tions on r k-up n improv w lf r . In p rti ul r, if p opl n ommit to rul n h v th m ns of p ym nt, r k-up p ym nt rul in u s th optim l s r h n r k-up h vior. If p opl n ommit to rul ut o not h v m ns of p ym nt, r k-up n rul in u s su -optim l ut w lf r -improving s r h n r k-up h vior. Th n lysis is m nt to rti ul t r son for su h pr ti s s s v r n or ivor p ym nt, lif -long mploym nt, n ivor n.

Sin th fo us of th n lysis w s on th v lu of mo ility r stri tions, I i not mo l th r m ining s , in whi h p opl nnot ommit to rul ut h v th m ns of p ym nt. L t us ri fly onsi r this s . In this s , urr nt p rtn rs n n goti t ft r m ting n lt rn tiv p rtn r n this woul l to n ffi i nt r k-up ision: urr nt p rtn rs will r k-up only if th joint g in from r k-up is gr t r th n th joint loss. How v r, th p ym nt will m y th woul - s rt p rtn r to th woul - s rting p rtn r, th opposit from th r k-up p ym nt rr ng m nt. M ting pot nti l p rtn r will th n ov rv lu n th r will too mu h s r h. Thus lthough n goti tion woul improv w lf r , it woul not hi v th optim lity, simil r to th r k-up n rr ng m nt.

In th mo l, th mo ility r stri tions w r ssum to s lf-impos y th urr nt p rtn rs. How v r, this is not ss nti l. Th r stri tions oul mo l to impos y thir p rty su h s gov rnm nt n this woul l to th s m r sults. A thir p rty n us ful in h lping to nfor rul . Thus w o s rv th l g liz s v r n p ym nt n ivor n. On th oth r h n , thir p rty m y h v l ss inform tion th n th first n s on p rti s, limiting its us fuln ss. Thus th l g liz s v r n p ym nt n ivor n t n to mor uniform ross iff r nt m t h s: in t rms of th mo l in this p p r, it is pl usi l to mo l gov rnm nt- nfor r k-up p ym nt n n rul s to in p n nt of th urr nt output, whos simpli ity woul r u th v lu of thos rul s.[6] A r l t issu , whi h th mo l str t from, is how pli it th r stri tions r . Som su h s l g liz s v r n p ym nt n ivor n r pli it. Oth rs su h s lif -long mploym nt in J p n r impli it n ustom ry.

Although th fo us of th n lysis w s on th ff t of mo ility r stri tions on w lf r , th mo l h s impli tions for som oth r sp ts of onomy. I will ri fly m ntion th s s on intuition n s ri s of num ri l r is s th t I rri out for st y st t s (i. ., th ggr g t v ri l s un r th st tion ry istri utions of p opl ov r urr nt output) of th mo l onomi s. First, th ggr g t l v ls of s r h n r k-up r lik ly to low r with mo ility r stri tions, th t is, in E onomy 2 n 3 th n in E onomy 1. Intuitiv ly, mo ility r stri tion low rs th v lu of s r h n r k-up (E onomy 2) or ir tly r u s mo ility (E onomy 3). S on , th istri ution of urr nt output is mor qu l with mo ility r stri tions. Equiv l ntly, with th r stri tions th r is l ss flu tu tion in p rson's onsumption ov r tim . This is us r k-ups, whi h l s to mo ility, t n to isp rs th istri ution of urr nt output: p rtn r mov s to high r output l v l whil his s rt p rtn r mov s to th low st output l v l. As oroll ry, th fr tion of p opl without p rtn rs is low r with mo ility r stri tions. Thir , th ff t of mo ility r stri tions on th ggr g t output is not l r n p n s on th p r m t r v lu s. Th ggr g t output p n s on th istri ution of p opl ov r urr nt output. Sin with r stri tions th r r l ss p opl with high urr nt output n l ss p opl with low urr nt output, th n t ff t is un l r.[7]

[6] A further complication of restrictions imposed and enforced by a third-party is the institutional arrangement by which the restrictions are formulated and implemented. This process of formulation and implementation is more complicated than if the restrictions are self-imposed, and thus leaves the room for inefficiency.

[7] The sum of aggregate output (as defined in the model) and aggregate search cost may correspond better to the usual concept of aggregate output. This sum is likely to be lower with mobility restrictions due to the low levels of search.

4. CONCLUDING REMARKS

In this p p r, I r ss th qu stion of why mo ility r stri tions r wi ly o s rv in mploym nt, m rri g , n oth r p rtn rships. I pr s nt mo l onomy th t f tur s pro u tion t ms n fo us s on th s r h for p rtn rs n form tion n r k-up of t ms. Th m in r sults r th t wh n th r r no r stri tions, th r is too mu h s r hing n too mu h r king-up u to th n g tiv t rn lity of p rson's r k-up ision on th s rt p rtn r, n th t r stri tions su h s r k-up p ym nt n r k-up n n improv w lf r . Thus th mo l r tion liz s mo ility r stri tions s w lf r -improving rr ng m nts. This pl n tion for mo ility r stri tions is iff r nt from thos s on politi l onomy with r sp t to optim lity. In th ro vi w of th issu , I onsi r this pl n tion s ompl m nt r th r th n n lt rn tiv to th oth rs.

In th r m in r, I will st t two limit tions of th urr nt mo l. First, th mo l is styliz n us ful for thinking out mo ility r stri tions in ro ly n omp ssing m nn r. Th r w k is th t th mo l nnot pl usi ly pt for qu ntit -tiv n lysis in its urr nt form. M king th mo l mor p rti ul r y ing f tur s, su h s symm try tw n p rtn rs, r l v nt to ont t n riving th qu ntit tiv impli tions woul us ful for v lu ting th m rits of th story. I l v this t sk for futur r s r h. S on , th urr nt mo l o s not pl in o s rv iff r n s in th gr of mo ility r stri tion ross ountri s n tim p rio s (.g., th gr t r s v r n p ym nt in Europ th n in th US, th n onm nt of ivor n in th 70's in It ly n Br zil).[8] This limit tion ppli s to isting mo ls s w ll. For n pl n tion for mo ility r stri tion to ompl t on , th iff r n s ross ountri s n tim p rio s th t l to th iff r nt gr s of r stri tion must i ntifi . In this p p r, I only

[8] A reason may be that there are differences in the efficiency of search and matching technology across countries and periods. In terms of the model, the matching function m may be scaled-up for the US in comparison to Europe and for the post-70's in Italy and Brazil in comparions to the pre-70's.

took on th minor t sk of pl ining why th r *may* mo ility r stri tion n l v th l rg r t sk for futur r s r h.

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