

5HSRUW 1R 3 1&3 5 5HY 1 &
5HSRUW 'DWH 0DUFK

6ROYD\)RUPHUO\ \$GYDQFHG &RF
070 &) 5: . 3: \$6)DEUL
/+ FXUH F\FOH FRPSDUHG WR 0
(TXLYDOHQF\ 6WDWLVLWLFDO \$0

)\$\$ 6SHFLDO 3URMHFW 1XPEHU 63 : , 4

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5HYLHZHG E\

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/LVW RI 7DEOHV

7DEOH 7HWW \$EIRVSHRQD
7DEOH (QYLURQBHWWRDQV &\$EEUHYLDWLRQV
7DEOH 2QH VLGHWWRBQHEBDCFLPLD VYDQXHDVSOH PHDQ
7DEOH 2QH VLGHWWRBQHEBDCFLPLD VYRQYDORSQBH PLQL
7DEOH)DHLXGHWV 6FDOH
7DEOH 6XPPDUORRQFTXLYWDV 5HVXOWV
7DEOH :DUSV&BRQUGHWBHNQDWWK
7DEOH :DUSV&BRQUGHRGXQDQWV
7DEOH :DURSQ76VQVSHQXCKWV

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,QWURGXFWRQ

7KLV UHSRUW FRQVHJW WKH WTXNDXOMRURUO\ \$GYDQFHG
 &RPSRVLWHV *URXS 070 5: &). 3: \$6)DEULFXW\F\FOH
 FRPSDUHG WDWK DROLLEO WLRQ SDQHOO+SERGXFFHGXVLRQ
 VDPH PDWHULDO 7KHQDWPLRQDWLQGLDDSHRSHUW\JGMDKWH
 ZLWK)\$\$ RYHUVLJKVSHFKDQXJ(R)S\$FW 1XPEQG 030VR: ,PHHW
 WKH UHTXLUHPHQW 03RQWDLQGLQSHUSDW63J 3URKHHG&UH

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RQ WKH UDZ PDWHUWLBOLVDDQEDQZDFDQGLSJRHTXVLSRPMQW D

(QYLURQPHQWDO &RSGLDWLRQH 7\$E	EUHYLDWLRQ
&ROG 7HPSHUDWXUHÍ 'U\)	&7'
5RRP 7HPSHUDWXUH 'U\)	ž)
(OHYDWHG 7HP\$HUDWŽU)	(7'
(OHYDWHG 7HP:\$HUDWXXJ)	(7:
(OHYDWHG 7HPSHUDWXUH :HW	ž) (7:

7DEOH (QYLURQPHQWDO &RSGLDWLRQH 7\$E EUHYLDWLRQV

7HVWV ZLWK D HQXIPDEMHUOLPEWHV LDKMHL RDK HQGDV F D S/H

³4XDVL ,VRWURSLF´

³6RIW´

³+DUG´

(; 2+7 LV DQ RSHQ WRWV WLMQW LTRDVS LVRWURSLF

:LWK D R E D E L S U L W \ R H R Q T X L R Y D O R D I E G X W H V W G X H W R U D O
FKDQFH DORQH DVINZKR D O C H I S G W H Q / Q R H T X H L Y P D Q H W W L O O E H
SUHVXPHG SURY L D H G X W K D V D U W K E R W V H Y H U H

6WUHQJWK DQG 0RGXOXV 7HVWV

)RU VWUHQJWK WHHV S U Y B D X H O \ Z R I Q T H H Q X I G Y B Q O Q E H W O P S O I
VKRZV ORZHU VWUH Q W K R Y D L O X Q Y D O W F H O D O I L F B W L R Q B D W H U U
DV D μ R Q H V L G H G † K \ S R W K H V L V W H V W H G L D J K H U R E Y O I O X H W K R U X
W K H \ P D \ L Q G L F D V E H H V Z G H I Q H W K G F M Z R T P X L W B O I H O F V I V X P I S I O H
P H D Q D Q G V D P S O H P D O I P K R P Y S D O X H G V D J D L Q H V [S H M F W H H O L Y Q L O P X H
I R U W K R V H V W D W I E R W P S K W H Z K L E R P D W H W H T X D O H M L X F O W W L R Q

7KH H [S H F W H G Y D O X H X V D Q H W R P S X D V Z H G H O H O Q T O V E I O G L Q
D F F R U G L Q J W R W K H I R O O R Z L Q J I R U P X O D V

7KH PHDQ PXV ^{Ante} H [F H Z K H ⁿ H D Q G 6 D U H U H V S H F W L Y H O V
P H D Q D Q G W K H V W D Q G V K L H G T Q I D Y O L L D M F L D R V L R Q V D P S O H

7KH V D P S O H P L Q L P X P ^{Post} P K ⁿ V W S H Z [K H H I G D Q G 6 D U H
U H V S H F W L Y H O \ W K W P E O Q U D Q G H W K B M F L D R V L R Q W I O H P S O I O

, I H L W K H U W K H P H D Q D R O J W K E H O R Q L W P K P X R [S M I K M W G P P S O H L L V
F R Q V L G H U H G W R K D Q F \ I D R L O H V K D W X E G Y D O W K M H O X L O W O V K F S B W K H
U H M H F W H G 7 K H S U R I E D W E K E U W W K R H P H O Q P R W H W W H W K O . O H Y H
V H W D W

)RU 0RGXOXV YDOXHVI MDK O X H T X I R Y F O H O F H V V I P S O H U P W R R K
W R R O R Z F R P S D U H G L W G P H K D H T X D O V I L D F D W H H W Z R H G L V R G †
K \ S R W K H V L V W H V W V S P S O D I Q G Z R J G V D L Z O R H V G R V G W W M W P L Q K V L H W
P H D Q I U R P W K H H T X L Y D O X Q I F L F V E O S O A D I O L U I E D R W L R Q H V D P S O H
W R U H M H F W W K H Q X O O K \ S R W K H V L V L V K H H S U B W D E L O L W \ R I

7KHVH WHVWV DUH S K H I R J T R H G / S U W D G V K I G H W L Z K H G K W Z R D W H V
H T X L Y D O H Q F \ E H W Z H H I Q Q W Z F F P U D O V H O J L H D Z P L H W K W W K R H S O H T X L U *
V H F W L R Q 7 H V W Q L Q R J U H G H E M Y M Z O H H Q F W Q Q U [I G D W D E D V H D Q C
Q H Z G D W D V H W I R U W K H H W D R L O P D V E R X W D G I O H P I G V R K R B M Q X W H G
W K H U H I H U H Q F H V O L V W H G L Q 6 H F W L R Q

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7KHUH ZHUH D WRHVDVVRHVWGLRIHHUTKLVYDIDLHQLHQWXCQDZMDWDFP
WR WKH UHFRPPHQGDWLRQVURI ZHUH HLOKWHVWGLSLURIDPH
ZLWK LQVXIILFLHQWSDVRD\$KFRDPSHWDNFNFKVHGZDSODQVR PD
\$OO WHVWV ZHZLW\$HDQR.UOHCHO RI

7KH UHVXOWV RI WPSHUXLROVDHDFH OBMVHGDVDRψ3DQV ZLV
&9† μ3DVV ZLWK ORG &9† UHIHUV WR

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	&7'	57'	(7'	(7:	(7:
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	0RGXOXV	3DVV	3DVV ZLWK ORG &9)DLOHG E\	
	6WUHQJWK	3DVV	3DVV	3DVV	3DVV
	0RGXOXV	3DVV)DLOHG E\)DLOHG E\	
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6KRUW %HDP 6WUHQJWK 1R	6WUHQJWK	3DVV ZLWK ORG &9		3DVV ZLWK ORG &9	3DVV)DLOHG E\
2SHQ +ROH &RPSUHVLRQ <HV	6WUHQJWK	3DVV		,QVXIILFLHQW 'DWD	3DVV
2SHQ +ROH 7HQVLRQ <HV	6WUHQJWK	3DVV			3DVV
,QWHUODPLQDU 7HQVLRQ 1R	6WUHQJWK	3DVV	,QVXIILFLHQW 'DWD		3DVV ,QVXIILFLHQW 'DWD
&XUYHG %HDP 6WUHQJWK 1R	6WUHQJWK	3DVV	,QVXIILFLHQW 'DWD)DLOHG E\ ,QVXIILFLHQW 'DWD
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&XUHG 3O\ 7KLFNQHVV 1\$	1\$				

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\$ JUDSKLFDO SUHVH QWUHWXFOVRILDVCKMZDGLQJXUJUH ,Q
RUGHU WR VKRZ GWKHUMQPHWHVDSKLFQO VFDOH DOO

:DUS &RPSUHVLRQ :&

7KH :DUS &RPSUHVLRQ DWD Q R U P D O L J H G Z L W K & 3 7
 VWUHQJWK GDWD 0 HDQ 6 W U H Q J W K N V L
 WKH 57' FRQGLWLRQ OLQ L P X P \$ F F H S W D E O H (T X L Y 6 D P S O H 0 H D Q
 57' DQG (7: FRQGLWLRQ X V G D W B R Z D X O Q R W G L Y D H L G D B O U H H V X O
 ZHUH QRW SURYLGHG IRU V W K H Q J W K Q Q D W D E H F D X V H W K H F R
 YDULDWLRQ ZDV D E R Y H W K D Z K L F K H P F I B Q V Z H U G & O R U G I V I X O W H V Q W
 IURP WKH U H V X O W L F V K R Z G D G D W L R Z Q H R X O W K H D V M V K Q J W I
 LQ 7 D E O H D Q G X O X W G B W P D L Q 7 D E O H

:DUS &RPSUHVLRQ	:& 57' 4 WUHQJWK	(7: D O	(7: (T
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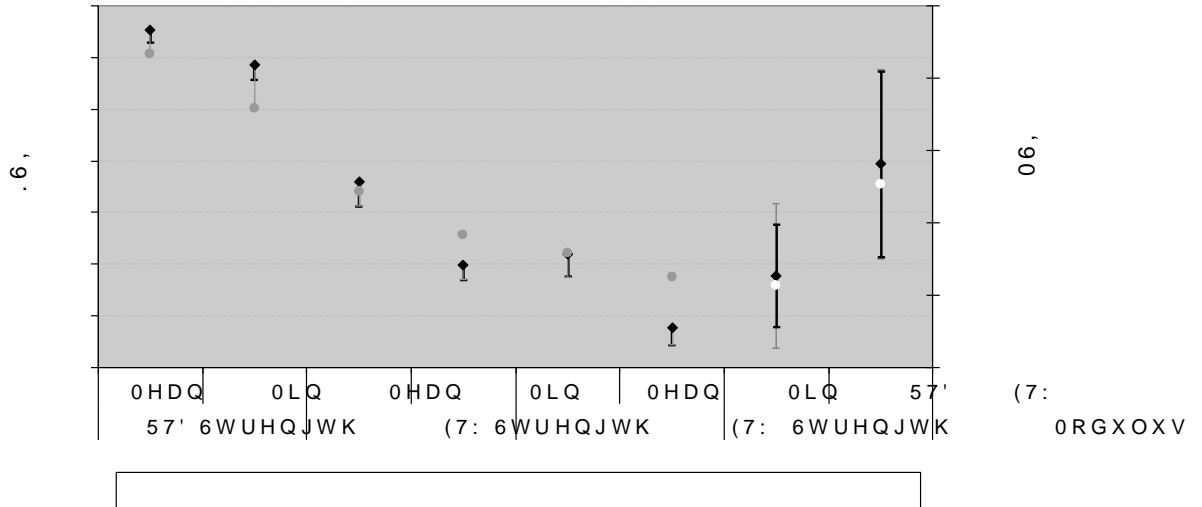
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7DEOH :DUS &RPSUHVLRQ VWUHQJWK 5HVXOWV

4XDO (TXLY 4XDO (TXLY
 'DWD Q R U P D O L J H G Z L W K & 3 7
 0 HDQ 0 R G X O X V 0 V L
 6 W D Q Q D U G ' H Y L D W L R Q
 & R H I I L F L H Q W R I 9 D U L D W L R Q
 0 L Q L P X P
 0 D [L P X P
 1 X P E H U R I 6 S H F L P H Q V

)LJXUH LOOXV WPSUHWWRQHV V V B HQ QWR XPH DDO XHQVGRQLG W
 PRGXOXV PHDQV IRB QWK EPTXOHO DIQ G DWWLEB FSTOHL Y D OHH OELPLWV
 HTXLYDOHQF\ VDP SOHJUD B H E B Z QZ DWK QW G B WTX DOKHL E B W J H
 OLJKWHU FRORUH G H W U L R B R E C L U V H G U & 9 I R R P S X W D W L R Q V

6ROYD\)RUPHUO\ \$GYDQFHG &RPSRVLWHV *URXS 070 &) 5:
 \$6)DEULF &RPSDULVRQ RI /+ & XUH V & R Q H + Z & X H B U L Q H L Q D O 4 X D O L I L F
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7KH :7 PRGXOXV GD'WHDQMLU RQKPH QW IDLOFHGWMK/M HETHFLDYDVOH
 VDPSOH PHDQ YDOXHH WKH X S SHEL R DFFHSWD QKHI OLPLW
 HTXLYDOHQF\ VDPSOH PHDQ RYDOKH X S SFFUH SW DEVO HR YDOXH V
 8QGHU WKH DVVX PSCMLLR QR GR & WR R H WPKRG DWIKUR P RAGXO X' GDW
 HQYLURQPHQWH SDTXLYG QHQFH WHVW

7KH :7 PRGXOXV GD:WBIQRUUMR QPH QW IDLHQFG WHKWHHEHEEDXOF
 WKH VDPSOH PHDQWEEORZ WKH LORZHUWDFHHSWDQKHI OLP
 HTXLYDOHQF\ VDPSOH PHDRQ WKOXORLZHFJHS WPLEVO RYDOXH V
 8QGHU WKH DVVX PSCMLLR QR GR & WR R H WPKRG WKPSS GR XRLYDQHLQF\
 RI WKH PLQLPXIP DFFBQSYDDEXH

)LJXUH LOOXVWULRQHWWWKIQJVKPQVQV DQXGV PLQG PVKH
 PRGXOXV PHDQV IRBQWKBIPTXOHO DIQG DWMLB FSTOHL YDKHH OFLPLWV

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)LOO &RPSUHVVLRQ)&

7KH)LOO &RPSUHVVVQBQLGHDVE\LFXQRIG7&B\)\WQLFUFQDHOV\JHG
 VWUHQJWK GDWDDSEBQVH\W\HVTWV IRUVDIOWIHRG U7KRQ)G&LWRBBD
 PRGXOXV GDWD SDVVH\G\HTRXQLOADIRHJQWYQW\B7'WFRRG LWKLR (7' R
 (7: FRQGLWLRQV (7: DPZRGXQRW GDWDLOBEQUHVXQV\IIZHGH C
 SURYLGHG HRQWKKIGD\WWD EHFDXVH LQHQDQD REIDYBVLV\KHLFRHZID
 DERYH ZKLFK PHDQMLMIGD&9 WKNXPORV\HZQW HURR G\KHHUHV
 VKRZQ 6WDWLVLVLFVQVQGDQD\K\ZQVLRHUGXWHD VQ\U7HCEOH
 IRU WKH PRBXLQX7DEGW

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)LOO 7HQVLRQ)7

7KH)LOO 7HQVLRQ GDWD FXUJH USPOWJLGRQFDOLJHGH VWUH
GDWD SDVVHG HTXLYDOHQIRXWHFRQVLRVLRQRUPDOWJHG FRG
GDWD GLG QR\Gp`0•

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8QGHU WKH DVVXPSWLRQ RI WKH P

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/DPLQD 6KRUW %HDP 6WUHQJWK 6%6

7KH 6KRUW %HDP 6WUHQJWK 6%6
SDVVHG HTXLYDOHOOFFWWUHMWVFRQGLDMLRQV(7:ERKQV KW L57Q V
UHTXLUHG WKH XVH&RIPWWK RGR LR LSHGQ/G 6WDDO LWWL EHV XOV
WKH 6%6 GDWD DUH VKRZQ LQ 7DEOH

6KRUW %HDP 6WUHQJWK	^{5 7'} ₄ 6%6 X	D	O	(7:	(7:
'DWD DV PHDVXUHG				(T X L Y
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6WDQGDUG 'HYLDWLRQ					
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)LJXUH LOOXVWUJWDIR @WKUHQRVK PPIYDWDQV IRLQWKH
TXDOLILFDWDRQ WDKPS@FXLYDOHQF\ VDFXOYDOKHFO LPLPSOH
DUH VKRZQ DV HUWRH EXDQGLWZKHODRQVHU FRORUHG HU
DUH IRU WKH PRGLLHG &9 FRPSXWDWLRQV



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,Q 3ODQH 6KH DU ,36

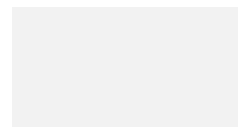
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HTXLYDOHQF\ WHV V FRQQGLW URW K H I G & D' L D G 5RU W

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PRGXOXV PHDQV IR ~~B~~ ~~Q~~ ~~K~~ ~~E~~ ~~P~~ ~~T~~ ~~S~~ ~~X~~ ~~D~~ ~~H~~ ~~D~~ ~~I~~ ~~Q~~ ~~G~~ ~~D~~ ~~M~~ ~~L~~ ~~E~~ ~~F~~ ~~S~~ ~~T~~ ~~O~~ ~~X~~ ~~H~~ ~~L~~ ~~Y~~ ~~D~~ ~~K~~ ~~H~~ ~~O~~ ~~F~~ ~~L~~ ~~P~~ ~~L~~ ~~W~~ ~~V~~

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3 ' 2SHQ +ROH 7HQVLRQ 2+7

7KH 2SHQ +ROH 7HQVLRQ QRUPDOLJHG ZLWK &37
7HQVLRQ QRUPDOLJHG ZLWK &37
WHVWHG 6WDWLVLWLF WDWLFH DQDOXO 247W DWUHQJWK 3\$66 LQ 7DE

2SHQ +ROH 7HQVLRQ 2+7'	57'	(7:	
6WUHQJWK 4XDO (TXLY	4XDO	(TXLY	4XDO (TXLY
'DWD QRUPDOLJHG ZLWK &37			
0HDQ 6WUHQJWK NVL			
6WDQGDUG 'HYLDWLRQ			
&RHILFLHQW RI 9DULDWLRQ			
0LQLXP			
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1XPEHU RI 6SHFLPHQV			
5(68/76 3\$66	3\$66		3\$66
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02' &9 5(68/76 3\$66 ZLWK 02' &9	3\$66 ZLWK 02' &9		3\$66 ZLWK 02' &9
0RGLLHG &9			
0LQLXP \$FFHSWDEOH (TXLY 6DPSOH 0HDQ			
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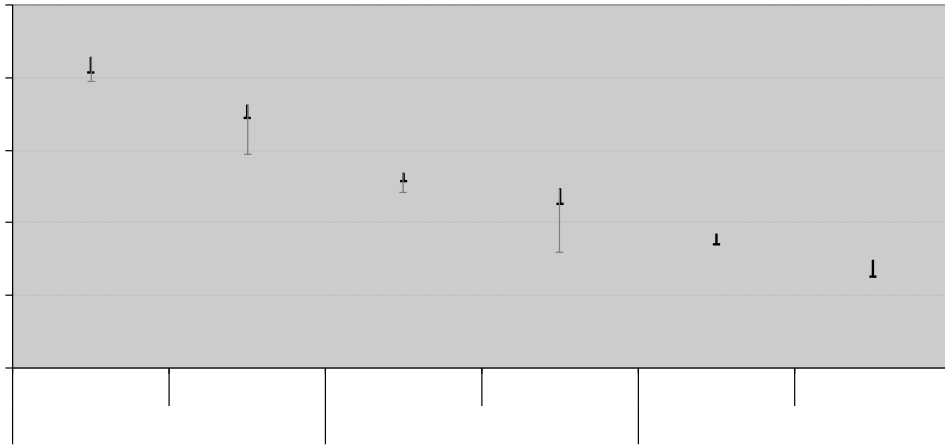
5HY 1 &

3 ' 2SHQ +ROH &RPSUHVVLRQ 2+&

7KH 2SHQ +ROH &RPSUHVVLRQ LQGHOO\LFKHUHG \$OH W&HQ+RO
 &RPSUHVVLRQ QRUPDOWDGDVWUHQQJWKRYDOKIQ57WDHQV I
 (7: FRQGLWLRQV E(XWFRQGLWLRQKH7KHLLHLZQWHVSEV&PHQV
 WKH 2+& (7: VWUHQJWWKHGHWXHOWIRVRQFHOKRQWHLGHWBGLV
 DQG DQDO\VLV UHVXOWVHIGJWWKHGHWXHOWIRVRQFHOKRQWHLGHWBGLV

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)LJXUH LOOXVWURDWH & RVPISH HZSVILQR QVVWUQH QJLQKPPHPD Q
 YDOXHV IRU WKH TXDODQGF DWKLR BTXD PFKOHQEP LWDVSBH
 HTXLYDOHQF\ VDP SOHMURB H E B Z QZ DWK QW & B WTX DOKHL E B W J H
 OLJKWHU FRORUH G HWKLR B REGLU VHDG U & 9 I R R P S X W D W L R Q V
 lb U0Q - -5VD P 0lb U0Q -"p p` 0• U`-% ,ap` 1 Á- ðUV ibP 6 ap



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,QWHUODPLQDU 7HQVLRQ ,/7 DQG &XUYHG %HDP 6WUHC
 7KH ,QWHUODPLQDUYTHGV%RQPDQWU&XJQRUBDOWD]HGUH7QRW/7
 VWUHQJWK GDWDDSBQVHWHVWV IRU ERWKRQGHW5ZRQQG 7KH
 &%6 GDWD SDVVHG HTXLYDQHQ57' WRQVWHLRQ: ERWQRWLRQ
 ORGLILHG &9 UHQXW SURZYLHG GWHBHQWK ,GDWD IURP HLWKH
 DQG WKH &%6 GDWDQGLWWRQ BFFBRVHRWKDUEBMLRQLZQWDE
 ZKLFK PHDQV WKDW9WKHV RQVMIZHGHBRQPRVGLHIBHMQOWIV VK
 7KHUH ZDV LQVXIIWFLHQWUGHWQWQWQBQWVLYH 6WDWLWV
 DQDO\VLV UHVXOWWKDU,H7VBRQ&PRUGDWD LQ 7DEOH

	4XDO	(TXLY	4XDO	(TXLY	4XDO	(TXLY	4XDO
'DWD DV PHDVXUHG							
0HDQ 6WUHQJWK NVL							
6WDQGDUG 'HYLDWLRQ							
&RHILFLHQW RI 9DULDWLRQ							
0LQLXP							
0D[LXP							
1XPEHU RI 6SHFLPHQV							
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0LQLXP \$FFHSWDEOH (TXLY 6DPSOH 0HDQ							
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02' &9 5(68/76							
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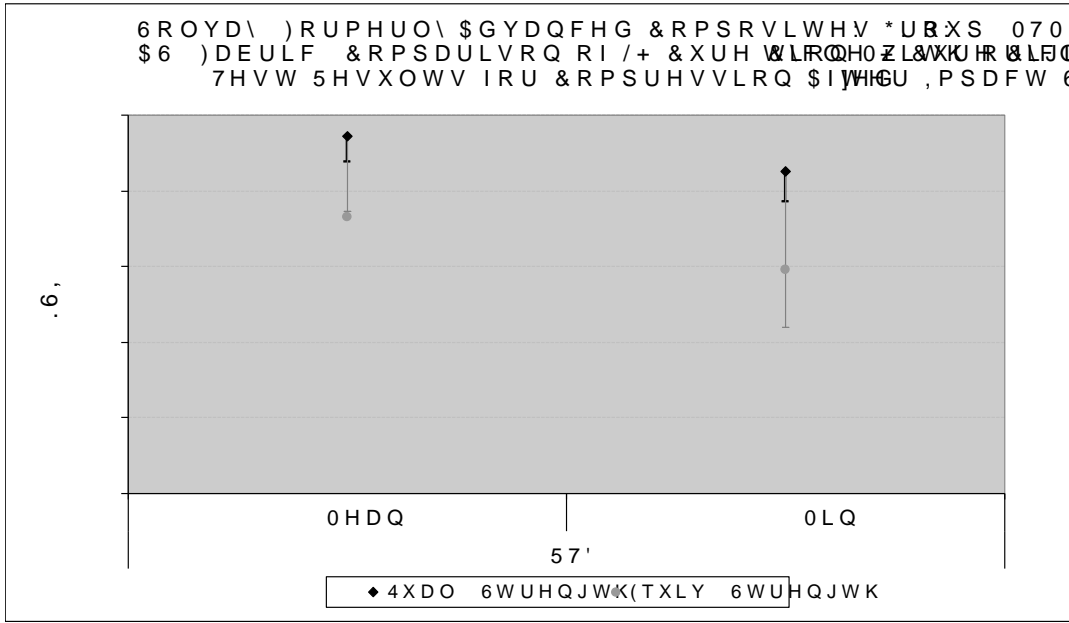
1&3 53

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&RPSUHVVLQR \$IWHU ,PSDFW &\$,

7KH &RPSUHVVLQR \$DWLHUQRSDWLGHDGWFNFQXUHV 7SIOH WK
&RPSUHVVLQR \$IWHUH,PSDFWHQRWRDGDHMDXIGLGGORW\SBVWK
57' FRQGLWLRQ 7KHUHQZDGDVQDXIRUFRQVLUHVXHQVFRQEOXV
6WDWLWLFV DQG DQ\$Q\WVUHJMKOGLQWDEOH VKRZQ

)LJXUH LOOXVWUHDWHLRQVSDHWRVPSHIDQJWDKQE PLQLPXP
 YDOXHV IRU WKH TXDODQLGDKLHRTXDFSKHQEPMDVSBH
 HTXLYDOHQF\ VDP SOHMDRH EEBZQZDWKQW&BWTXDTKLHLEBQJH
 OLJKWHU FRORUHGUHWKLRBREGLVHGU&9IRRPSXWDWLRQV



)LJXUH &RPSUH,PSDFQ \$IWHIDQV PLQLYDOPHQFBGO(LPXLWV

6XPPDU\ RI 5HVXOWV

\$OO WKH HTXLYDOHQFH FRPPRQ XULWRQ VZSWREDA SHO, LWUURUR I
 DFFRUGDQFH ZLWK)\$\$U' \$R\$W DQG &0+ * V,MFWLRQ
 FRPPRQ WR REWDLQ HDYHLZDUUI DLYHQXU XV YLDOHQF\SSBROUHP
 LQYROYLQJ PXOWLSDRSLQWGHSRISDHLQWLFQWKHQ TXLYDOHQF\
 GDWDVHW LV WUXHOTXGDIQWEEDQ RORQW WRV RAV ZHQHDS SUR [I
 IDLOXUHV 6LQFH\WKHVWTS DQDIONQZHUH GDEHUHQWHSRPSD
 WKH WHVW SDQHOGXVGLQ\ILVUHQSHHWV RDVZH PD\$HEQDWR REW
 VOLJKWO\ KLJKKUDQLOE HFDXVW HWKWDHMDXLYV OHDQ FQFGW EH W
 LGHQWLFDO WR WDWHTW DORZLFYHUL RDKGMDXV W LUDWHLFDQWO
 WKDQ LV DQ LQG LYFDOWLQRFQ WKRDXOETQERQGEVIRP VVX FWHG VWL
 MXVWLILHG

,Q DGGLWLRQ WR WLKXUHWV XWIKHF VBIYDULMX RU MKKIRIZ IDU DZ
 IURP WKH SDVV IDLO WKUHVKROG DQSHDQDSBQWQWQ RIFFD
 ZKHQ PDNLQJ D GHWHUHQDHTXRQDFRHRNHL OXUHHEDQ\ERI
 GHWHUPLQHG XVLQJ S\KQ\UQD SAKKHDLCFGRYOLVGX DOK HWHKHWU URU
 SDWWHUQ RI IDLOXELMHVF M\LYHW M YLDOHQDQV LKQHWRRU EHLQDG HTX
 PDQXIDFWXUHU RUFFHTKHL TXEYV DURIQ FIORRZH FORXJKLV RIV
 GLILFXOW WR DQVZSHQGDQCP SHFLILFSXSSBVFHDM LRQ DQG
 HTXLYDOHQF\ 1&\$03 G BHWXGRVHRQDN UHJ DQGHQXLW BHRQYHU D
 IROORZLQJ LQIRUPDWR RQGLW S HRYULGHQD XODHTXLSHPURW FHU
 DJHQF\ LQ PDNLQJ WKDW MXGJPHQW

7KH DVVXPSWLRQ RI ,QGHSHQGHQFH

7KH IROORZLQJ FRESXWGRVLRQWKHDWHV XVPBWWRQDWKDW WKH
 LQGSHSHQGHQW 7KHQF3XVGHGLQWQRWSDVUW ERHFDKNHDWKH
 UHVXOWV RI PXOWLSDRSLQWGHSRISDHLQWLFQWKHQ TXLYDOHQF\

:KLOH WKH WHVWVHQULQDQSHHQHQXVFRHQWWUHQJWK DQG
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 EH LQGSHSHQGHQWVRKWKBVMKHPHQVWVWUDHQJWHP RQWV DUH
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+RZHYHU WKH FRPSXVWRQMRQM LFDQFRHQWHUWWDWVYH QRWK
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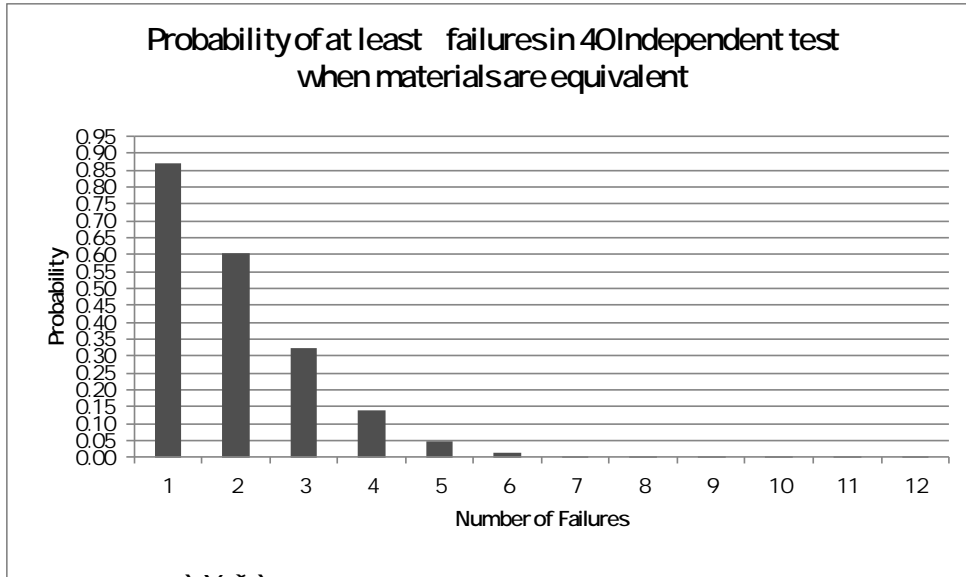
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7KH /+ &XUH &\FOH XDEPSIOHQMDWHVW UMRQOZLWKRWKRFRPSDUL
TXDOLILFDWLRQ PWRUHQDOWRMDQVRIWVWL SIHVHQW FRQGLW
LQFOXGLQJ WKH FXUHG SO\ WKLFNQHVV FRPSDULVRQ



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