DISCUSSION PAPERS IN ECONOMICS

Excessive Entry and Investment in Deregulated Markets: Evidence from the Electricity Sector

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0DUNHWV (YLGHQFH IURP WKH (

$OH[+LOO

7KHUH LV D VXEVWDQWLDO WKHRUHWLFDO OLWHUDWXU
LQ LQGXVWULHV ZLWK IUHH HQWU\ 7KH UHVWUXFWXULQJ R
PLG V SURYLGHV D XQLTXH RSSRUWXQLW\ WR HPSLULF
LQYHVWPHQW LQ D ODUJH LQGXVWULDO VHFWRU /HYHUDJL
LGHQWLILFDWLRQ VWUDWHJ\ WKLV SDSHU VKRZ UHVWUXFW
DV UHWDLO VDOHV JURZWK DQG IXOO SULFHV ZDV DVVRFL
PHJDZDWWV RI VWDWH SRZHU SODQW FDSDFLW\ RYHU WKH
VL]H DQG GXUHGè0HD0à °ó—ñ `ˆ ZDV ODWHU DVVRFLDW

DOWHUQDWLYH WKHRUHWLFDO PRGHOV RI RYHULQYHVWPHQ
LQGXVWU\ LV PRVW FRQVLVWHQW ZLWK PDUNHW FRRUGLQD
DQG D FRQWDJLRQ HIIHFW -(// / / 4

,QWURGXFWLRQ

)UHH HQWU\ LV D QHFHVVDU\ EXW QRW VXIILFLHQW F
PD[LPL]LQJ VRFLDO ZHOIDUH :KHQ IRU H[DPSOH FRPSHWL
FDQ UHVXOW LQ LQDGHTXDWH RU H[FHVVLYH $SHOODWLRQLUQHDOODW
VLPXOWDQHRXV HQWU\ RI ILUPV LQWR D PDUNHW FDQ UHVX
RSWLPDO R(XPEHPFLDO HYLGHQFH IRU WKHVH HIIHFWV KDV E
SDSHUV IRFXVHG RQ WKH ZHOO HVWDEOLVKHG UHVXOW RI

6HH 6SHQFH DQG 'L[LW DQG 6WLJOLW] IRU KHWHURJHQRXV
DQG 0DQNLZ DQG :KLQVWRQ
6HH 'L[LW DQG 6KDSLUR %ROWRQ DQG)DUUHOO DQG &DUDE
6HH -RYDQRYLF -RYDQRYLF DQG 0DF'RQDOG .OHSSHU
DQG :DOGIRJHO LV RQH RI WKH IHZ SDSHUV WR SURYLGH HPSLULF

WKHUH ZDV H[FHVVLYH HQWU\ ... KH LQ PSOH VLF DXV WR XULHG VPHUJHQHDW
PDUNHWV OHDG WR RYHULQYHVWPHQW LQ SRZHU SODQW FD
FRPSDULVRQ WR QRQ UHVWUXFWXUHG VWDWHV DQG D VW
SODQWV LQ UHVWUXFWXUHG PDUNHWV DUH IXUWKHU HYLGH

    7KH GHWDLOV RI WKH JDV ERRP GXULQJ WKH UHVWUX
&RQWDJLRQ PRGHO RI HQWU\ DQG H[LW ,Q WKLV PRGHO I
WKH DFWLRQV RI RWKHU ILUPV UDWKHU WKDQ PDUNHW IX
ILUPV LQ WKLV LQGXVWU\ VXIIHUHG IURP D FRRUGLQDWLR
SODQWV ODFN LQIRUPDWLRQ RQ PDUNHW GHPDQG SURMH
QHWZRUNV ZKLFK FRQWULEXWHG WR D IDLOXUH E\ WKH PD
DPSOLILHG WKH HIIHFW RI WKH SUHYLRXV WZR ZDV WKH D
ORQJ UXQ JOREDO LQWHUHVV UDWHV

    $ IRUPDO ZHOIDUH DQDO\VLV RI WKH H[FHVVLYH LQYHVV
UHVXOW RI WKLV SDSHU 7ZR VHSDUDWH HIIHFWV RI IUHH H
WKH LPSDFW RI UHVWUXFWXULQJ RQ WKH SULFH DQG TXDQ
ORVV IURP RWKHU LQYHVWPHQWV FURZGHG RXW E\ WKH RY
V\QWKHWLF FRQWURO WR HVWLPDWH FRXQWHUIDFWXDO SU
JHQHUDWLRQ LV HVWLPDWHG WR KDYH OHG WR D WRWDO Z

    7KH VWUXFWXUH RI WKLV SDSHU LV RUJDQL]HG LQ WK
LQIRUPDWLRQ RQ WKH HOHFWULFLW\ PDUNHW VHWWLQJ RI
HOHFWULFLW\ LQGXVWU\ HQWU\ WKDW DUH WHVWHG LQ WK
PRGHO XVHG WR DQDO\]H WKH UHVHDUFK TXHVWLRQ LQ W
SUHVHQWV WKH HPSLULFDO UHVXOWV RI WKH SDSHU 6HF
6HFWLRQ VKRZV WKH UHVXOWV RI DOWHUQDWLYH VSHFLI
UHVXOWV RI WKH ZHOIDUH DQDO\VLV RI H[FHVVLYH HQWU\

  %DFNJURXQG

    3ULRU WR WKH PLG V HOHFWULFLW\ JHQHUDWLRQ L
YHUWLFDOO\ LQWHJUDWHG SXEOLF XWLOLWLHV 3ULFHV ZH

([FHVVLYH HQWU\ DQG RYHULQYHVWPHQW DUH GHILQHG LQ WKLV SDSH
LQFUHDVH RI D VWDWH DQG ZKDW LWV V\QWKHWLF FRQWURO FRXQWHU

GHWHUPLQHG E\ H[SHQGLWXUH RQ IXHO DQG 2SHUDWLRQV

LQYHVWPHQW DQG D UHDVRQDEOH UDWH RI UHWXUQ RQ FD

EXW IDFHG SUHVVXUH LQ WKH   V DV SULFHV URVH IRU F

WKH UHVXOW RI LGOH FDSDFLW\ EXLOW WR PHHW HOHFWUL

5LVLQJ SULFHV DQG WZR HQHUJ\ ODZV LQ   3XEOLF 8W

$V QRWHG LQ D QXPEHU DRFRPSDELHUDWWR R QWKHFULJKVGMPDG

:KLOH WKH ERRP LV LGHQWLILDEOH LQ ERWK &&*

DPRXQW RI &&*7 FDSDFLW\ DGGHG LQ UHVWUXFWXUHG VWD

7DEOH   &&*7 DQG *DV &7 &DSDFLW\ $GGLWLRQV E\

5HVWUXFW   1RQH   6RXWK

&&*7

&7

6RXUFH (,$

([SODLQLQJ WKH *DV %RRP

7KH VKLIW WRZDUGV JDV ILUHG SRZHU SODQWV LV QR
OLWHUDWXUH)LJXUH $ SURPLQHQW H[SODQDWLRQV DUH RIIHUHG IRU
7KH DGRSWLRQ RI QHZ FRPELQHG F\FOH WHFKQRORJ\ DQG
FRVW HIIHFWLYH UHODWLYH WR FRDO DQG QXFOHDU SODQ
V OLIWHG UHVWULFWLRQV RQ WKH XVH RI QDWXUDO JD
HOHFWULFLW\ GHPDQG FUHDWHG D QHHG IRU QHZ LQYHVWP
RYHU FRDO SODQWV *DV SODQWV FDQ EH EXLOW PXFK T

7KLV UDWLR LV VSOLW LQWR WKUHH JURXSV WR JDLQ SHUV

VWDWHV 7KH 6RXWK LV VHSDUDWHG IURP WKH 1RQH JURXS

)LJXUH   &DSDFLW\ WR (56 5DWLRV E\ *URXS

6RXUFH (,$

'XULQJ WKH SHULRG   XWLOLWLHV DFURVV WKH &
WR LGOH FDSDFLW\ IURP WKH   V :KLOH LW¶V GLIILFXOW
ZDV GXULQJ WKLV WLPH SHULRG WKHVH DFWLRQV2FRQILUP
WKH WKUHH VWDWH JURXSV WKH 1RQH JURXS KDV WKH OD
VWDWHV OLNH :HVW 9LUJLQLD DQG :\RPLQJ ZKLFK DUH OD
FHQWXU\ DOO WKUHH JURXSV RI VWDWHV FRQVWUXFWHG O
WR (56 UDWLRV ZHUH WRR ORZ +RZHYHU ZKLOH WKH WZL
OHYHOV WKHUH ZDV D PXFK ODUJHU LQFUHDVH LQ WKH UH
(56 LQ WKHVH VWDWHV UHDFKHG KLVWRULF KLJKV (,$ $QQ
HYLGHQFH WKDW SULRU WR WKH *UHDW 5HFHVVLRQ LQ

DUH DVVXPHG WR KDYH WKH SRWHQWLDO WR RSHUDWH DW WKH VDPH F
FDSDFLW\ IDFWRUV GXH WR LQGLYLGXDO VWDWH ZHDWKHU SDWWHUQV
   -RVNRZ   QRWHV WKDW WKH HDUO\   V ZHUH D SHULRG RI H[FHVV
DV D GUDZLQJ GRZ @ xHVZ OOP

WKHVH KLJK UDWLRV EXW DV)LJXUH   VKRZV ORZ RU QH
VWDJQDWH RU LQFUHDVH

)LJXUH $YHUDJH \HDU (56 *URZWK E\ *URXS

6RXUFH (,$

,QGLYLGXDO VWDWH (56 GDWD DUH QRW DYDLODEOH S
VKDUS VORZGRZQ LQ (56 JURZWK VWDUWLQJ LQ WKH HDUO\
$(2 $V WKH 86 HFRQRP\ JUHZ DW D IDVWHU UDWH L
XQH[SHFWHGO\ ZKLFK DFFRXQWV IRU WKH GHFOLQH LQ LQ
:KHQ DQDO\]LQJ WKHVH GDWD QRWH WKDW SRZHU SOD
WKDW UDQJH IURP   \HDUV IRU JDV &7 DQG &&*7 SODQWV
QXFOHDU DQG LV KHDYLO\ UHOLDQW RQ H[SHFWDWLRQV DER
(,$ 1XFOHDU (QHUJ\ ,QVWLWXWH   3ODQWV WKDW FD
FRQGLWLRQV LQ   DQG

2QH LQWHUHVWLQJ DVSHFW RI WKH ERRP SHULRG LQ
LQGXVWU\ LQVLGHUV WR SUHGLFW LW (DFK \HDU WKH (,$
IURP ERWK DYDLODEOH GDWD DQG LQGXVWU\ H[SHUWV DQG

GHPDQG 7KH HVWLPDWHV DUH DGMXVWHG DQQXDOO\ WR U

XSGDWHG HVWLPDWHV E\ (,$ VWDII $V LV HYLGHQW LQ 7DE

WKURXJK   ZHUH LQFUHDVHG FRQWLQXRXVO\ WKURXJKRX

XQGHUHVWLPDWHG HDFK \HDU

7DEOH $QQXDO $(2 *HQHUDWLRQ &DSDFLW\ 3URMHFW

			&RDO		&&*7		*DV &7	
$(2	___	___	___	___	___	___		

(DFK RI WKH IRXU PRGHOV LQ WKLV VHFWLRQ EXVLQHV[...]
ILUVW PRYHU DGYDQWDJH DQDO\]H KRPRJHQRXV JRRG PDU[...]
SRVVLEOH RXWFRSH RSRVH RI WKHLU LQFOXVLRQ LQ WKLV [...]
WKHRUHWLFDOO\ EXW UDWKHU WR SURYLGH WHVWDEOH S[...]
FRQVLVWHQW ZLWK HQWU\ DQG H[LW SDWWHUQV IROORZLQ[...]
FULWLFDO WR WKH SUHGLFWLRQV WKDW RULJLQDWH IURP W[...]

$VVXPSWLRQ   7KHUH DUH PDQ\ HQWUDQWV LQWR HDFK PD[...]
(OHFWULFLW\ LV D KRPRJHQRXV JRRG JHQHUDWHG DQG [...]
XWLOLWLHV SRZHU PDUNHWHUV IHGHUDO VWDWH DQG [...]
LQGXVWULDO WKHUH LU RV D ODUJH QXPEHU RI ILUPV ZHUH DEO[...]

$VVXPSWLRQ   )LUPV HQWHULQJ WKH PDUNHW PXVW FRQVW[...]
:KLOH QRW DOO ILUPV HQWHULQJ UHVWUXFWXUHG PDU[...]
SXUFKDVH WKH GLYHVWHG DVVHWV RI IRUPHU YHUWLFDOO\[...]
WKH QHZ FRQVWUXFWLRQ RI SRZHU SODQWV)RU WR SRZHU GUW[...]
WKDW FKRVH WR FRQVWUXFW QHZ SODQWV WKH RYHUZKHO[...]
&&*7 SODQWV :KLOH LQ D JHQHUDO EXLOG FKRLFH PRGHO[...]
ILUPV FKRRVH WKH WHFKQRORJ\ DQG IXHO RI WKH SODQW[...]
EXLOG WLPHV DQG LPSURYHG HIILFLHQF\ OHG QHZ EXLOGH[...]

$VVXPSWLRQ   ,QFXPEHQWV KDYH D GLIIHUHQW FRVW VW[...]
LQYHVWPHQW FRVWV DQG ORZHU PDUJLQDO FRVWV

7KH VKDUH RI &&*7 SODQWV LQ UHVWUXFWXUHG VWDWH[...]
PDMRULW\ RI SODQWV LQ RSHUDWLRQ GXULQJ WKLV WLPH Z[...]
W\SHV KDYH KLJKHU FDSLWDO FRVWV DQG ORZHU IXHO FRV[...]

$ ODUJH QXPEHU RI PRGHOV ZHUH FRQVLGHUHG LQ WKLV VHFWLRQ Z[...]
PDWFKHG HOHFWULFLW\ PDUNHWV LQ WKLV WLPH SHULRG   +RPRJHQR[...]
,PSHUIHFW LQIRUPDWLRQ OHDGLQJ WR WKH SRVVLELOLW\ RI FRRUGLQD[...]
,QIRUPDWLRQ RQ SDUWLFLSDQWV LQ WKH JHQHUDWLRQ DQG UHWDLO [...]
IRUP   DQG (,$ IRUP   UHVSHFWLYHO\
6HH ,VKLL DQG <DQ   IRU DQ H[SODQDWLRQ RI WKH EXLOG RU EX\[...]

ASSUMPTION   ENTRY SUFFERS FROM A COORDINATION FAILO...

   COORDINATION FAILURES COME IN SEVERAL FORMS R...

SCHELLING'S   WHERE TO MEET PROBLEMS TO MULTIP...

FOR THE ELECTRICITY INDUSTRY UTILITIES TRADITIO...

AWARE OF ALL PLANTS BEING PLANNED AND BUILT AS

RESTRUCTURED MARKETS THIS INFORMATION WAS MORE

WERE MOST LIKELY UNAWARE OF THE INTENTIONS OF OTH...

Following the analysis in Mankiw and Whinston

the business stealing model applied to the elec...

the process of restructuring firms enter the mark...

structure and previous prices in the market

DYDLODEOH LQIRUPDWLRQ IRU WKHVH IDFWRUV DQG EDVH

ILUPV REVHUYHG LQYHVWLQJ ё 7 Q LVWKHSPDUNHLW 2Q FFR DQLDG3P

SHULRG WKH PDUNHW ZLOO EH RSHQ WR FRPSHWLWLRQ 2[
SHULRG   ,Q SHULRGV   WKURXJK 7 ILUPV FRPSHWH ZLWK W
HQWUDQWV PDNH DQ LQYHVWPHQW WR HQWHU LQ WKH IRO
HQWU\ SULFHV IDOO)DOOLQJ SULFHV RU ULVLQJ FRVWV O
WKH LQGXVWU\

3URSRVLWLRQ   8QGHU FRQWDJLRQ HQWU\ DQG H[LW
   D)LUPV FRQWLQXH WR LQYHVW LQ PDUNHWV ZKHUH ODUJ
   E ([LW RFFXUV E\ ILUPV SUHYLRXVO\ SURGXFLQJ LQ WKH
   F 1RQ IXQGDPHQWDOV GHFLVLRQ PDNLQJ OHDGV WR H[FH

     $W WLPH   WKH LQFXPEHQW LV VWLOO RSHUDWLQJ XQ
RQ FRVW RI VHUYLFH UHJXODWLRQ)LUPV REVHUYH WKH K
DVVXPH WKH\ ZLOO FRQWLQXH EDVHG RQ WKH H[LVWHQFH
PDQ\ UHVWUXFWXUHG VWDWHV DQG UXOHV SXW LQ SODFH
WKHLU YDOXH HQFRXUDJHV WKH HQWU\ RI D ODUJH QXPEHU
&&*7 SODQWV DQG FRPSHWH ZLWK WKH LQFXPEHQW ,Q WKH
KDYH UHPDLQHG KLJK DQG GXH WR WKH FRRUGLQDWLRQ I
ILUPV VHH D VXUSULVH QXPEHU RI ILUPV HQWHULQJ WKH P
LQYHVWLQJ LQ D PDUNHW ZKHUH ODUJH LQYHVWPHQWV LQ
WHVWDEOH SUHGLFWLRQ $V &&*7 FDSDFLW\ ULVHV ILUPV
UHVWUXFWXUHG PDUNHWV)DOOLQJ SULFHV OHDG VRPH ILU
RU GHFODULQJ EDQNUXSWF\ 7KLV LV WKH VHFRQG WHVWDE
RWKHU ILUPV OHDYLQJ WKH LQGXVWU\ LQYHVWPHQW GHFO
FDSDFLW\ GXH WR H[FHVVLYH HQWU\ ZKLFK LV WKH WKLUG

6HH -RVNRZ   IRU PRUH RQ VRPH RI WKH VWUDWHJLHV WR VDYH VW

)LUVW 0RYHU $GYDQWDJH

&RQVLGHU D PRGHO RI VHTXHQWLDO HQWU\ ZLWK LP

(QWU\ LQ WKLV PRGHO LV LJQLWHG E\ WKH RSHQLQJ RI
RI YDULDEOH SURILWV LQ H[SHVVWURRGQYHHQVWPHULQWQJFRLVVUPW
EXLOG ODUJH SODQWV GXH WR WKH FRPELQDWLRQ RI LQFU
SUHYLRXV LQYHVWPHQW

0 H W K R G R O R J \   D Q G   ' D W D

7 K H   L P S D F W   R I   H O H F W U L F L W \   P D U N H W   U H V W U X F W X U L O

W K U R X J K   W K H   Y D U L D W L R Q   L Q   L Q Y H V W P H Q W   G H F L V L R Q V   W

W R

HOHFWULFLW\ SULFHV IXWXUH H[SHFWDWLRQV RI IXHO DQG

WKH ORFDWLRQ RI H[LVWLQJ WUDQVPLVVLRQ OLQHV ZLWK V

SRVVLELOLW\ RI IXWXUH UHJXODWLRQ WKH SUREDELOLW\ I

DQG ZDWHU

    7KLUG PRGHOLQJ GHFLVLRQV E\ ILUPV DV LI WKH\ RFF

WKH LQIOXHQFH RI HDFK VWDWH RQ WKH GHFLVLRQ PDNLQJ

PD\ OHDG WR ELDVHG FRHIILFLHQWV DV ZHOO DV ELDVHG

RQO\ RFFDVLRQDOO\ PDNH FDSDFLW\ PL[GHFLVLRQV GLU

WRSRJUDSK\ WUDQVPLVVLRQ DQG SLSHOLQH FDSDFLWLHV

REVHUYDWLRQ

)RXUWK WKH DXWKRUV ZHUH UHWLFHQW DERXW HPSORF

DFWXDO SODQW GDWD DQG VXSSOHPHQWHG ZLWK EHVW HV

ODUJHO\ GXH WR WKH ODFN RI DYDLODEOH H[SHFWHG FRVW

VWXGLHV 7KHVH GDWD DUH HVVHQWLDO LQ D VWDWH OHY

 QRWHV XVLQJ RQO\ DFWXDO GDWD FDQ OHDG WR WUX

H[SHQVLYH SODQQHG SODQWV

    7KLV VHFWLRQ ZLOO ILUVW PRWLYDWH WKH LQYHVWP

FRQVWUXFWLQJ D VWUXFWXUDO IUDPHZRUN WR HVWDEOLVK

SODQW LQYHVWPHQW 7KH UHVXOW IURP WKLV VHWXS ZLO

XVLQJ D UHGXFHG IRUP SDQHO DSSURDFK)LQDOO\ WKLV

SRZHU SODQW LQYHVWPHQW WR PRWLYDWH WKH UHVXOWV

)RU H[DPSOH FRQVLGHU WKH GHFLVLRQ RI ZKHUH WR VLWH ZLQG WXU

ZLQG OHYHO LQ WKH DUHD ORFDWLRQ RI H[LVWLQJ RU SODQQHG WUDQ

VWDWH 536 FRVW RI PDWHULDOV DQG ODERU DYDLODELOLW\ RI VXEVL

RI VLWLQJ FRQFHUQV H[SODLQHG LQ 36& $ PRGHO EDVHG VROHO\

IDFWRUV EXW QRW DOO RI WKHP DQG DV D UHVXOW RIIHU SRRU SUHG

FRQVLGHU WKDW LQ WKH ODVW GHFDGH VWDWHV VXFK DV 1HZ -HUVH\

LQYHVWPHQWV LQ VRODU HQHUJ\ SURGXFWLRQ IDFLOLWLHV GHVSLWH O

FRDO RU QDWXUDO JDV UHVRXUFHV (,$ 7KHLU FRPSHWLWLRQ ZLW

UHQHZDEOH HOHFWULFLW\ UHWDLO VDOHV WR VDWLVI\ VWDWH 536 SUR

KDYH EHHQ SUHGLFWHG LQ D PRGHO EDVHG RQ FRVW

0RGHO 6HWXS

)ROORZLQJ WKH VWDQGDUG QHRFODVVLFDO PRGHO RI L

DQG ,VKLL   D ILUP HQWHUV WKH HOHFWULFLW\ PDUNH

E\ FRQVWUXFWLQJ D SRZHU SODQW 7KH ILUP LQYHVWV LI V

HDUQHG IURP WKH RSHUDWLRQV RI WKH SRZHU SODQW H[FH

ERWK WKH LPSDFW RI WKH SRZHU SODQW RQ SURILWV LQY

IXWXUH)LUP L FKRRVHV WKH OHYHO RI LWV LQYHVWPHQW

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D ZRUNDEOH HPSLULFDO PRGHO WKH VSHFLILF VWUXFWXU

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LV D SUREOHP ZLWK LGHQWLI\LQJ WKH FRUUHFW HOHFWUL

IORZ GDWD IURP LQGLYLGXDO SODQWV LV QRW DYDLODEOH

(PSLULFDO 0RGHO

7KH FKRLFH RI VL]H SULPH PRYHU DQG IXHO W\SH RI
LQFOXGHG LQ WKH LQYHVWPHQW HTXDWLRQ

<HDU HIIHFWV DUH DOVR LQFOXGHG WR FDSWXUH EURDG W

WLPH SHULRG VXFK DV FKDQJHV LQ WHFKQRORJ\ DQG ERR

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,Q WKH HTXDWLRQ DERYH V LQGH[HV VWDWHV DQG W L

FDSDFLW\ RI D SODQW LQ PHJDZDWWV 0: DQG LV PHDVXUH

D JLYHQ \HDU

RIWHQ HQGRJHQRXV)DEUL]LR HW DO   'DYLV DQG :ROIU

WKDW WKH VWUXFWXUH DQG H[SHUWLVH RI VWDWH OHJLVO

ZHUH FRUUHODWHG ZLWK VWDWH GHFLVLRQV WR UHVWUX

'DPVJDDUG $UGRLQ DQG *UDG\   7KHUH LV QR HV

VWUXFWXUH DQG SUHIHUHQFH IRU JDV ILUHG FDSDFLW\ VR

OLQN EHWZHHQ HOHFWULFLW\ SULFHV DQG UHVWUXFWXULQ

QRWLQJ KRZ WKHVH DXWKRUV DV ZHOO DV 'DYLV DQG :ROI

7KH UHVWUXFWXULQJ HQGRJHQHLW\ FRQFHUQ LV WKHU

AVERAGE CAPACITY FACTORS FOR POWER PLANTS THE ONL...

IF THESE STATES WERE LARGE EXPORTERS OF ELECTRICIT...

PRIOR TO RESTRUCTURING BUT THEIR LOW CAPACITY FAC...

NOT SELLING THE ADDITIONAL ELECTRICITY THE NEW...

FOLLOWING FABRIZIO ET AL   DAVIS AND WOLFRAM

ASSUMED TO BE EXOGENOUS WITH THE ADDITION OF YEAR D...

DATA AND SUMMARY STATISTICS

THE APPROACH USED IN THIS PAPER TO ANALYZE CHAN...

AMOUNT OF DATA ON THE INDIVIDUAL STATE LEVEL FROM...

ANALYSIS

UHSRUWV RQ QDWXUDO JDV FRDO QXFOHDU JHRWKHUPDO

QXFOHDU SRZHU 9HQW\[DQG 15(/

7KH UHVWUXFWXULQJ YDULDEOH XVHV GHWDLOHG LQIR
WKH (,$ DQG LQGLYLGXDO VWDWH UHJXODWRU\ FRPPLVVLR
VWDWHV LQLWLDWHG DORQJ WKH UHVWUXFWXULQJ SURFH
SURJUDPV OHJLVODWLYH DFWLRQ GLYHVWLWXUH RI DVVHV

&&*7

7DEOH   VKRZV WKH LPSDFW RI HOHFWULFLW\ PDUNHV

YDULDEOH EHLQJ H[SODLQHG LV WKH FKDQJH LQ &&*7 FDSD

DUH GLIIHUHQWLDWHG E\ WKH QXPEHU RI \HDUV DIWHU UHV

LQWHUDFWLRQ EHWZHHQ UHVWUXFWXULQJ DQG WKH SRVW

DGGLWLRQDO FDSDFLW\ HDFK \HDU FRPSDUHG WR QRQ UHV

$V WKH QXPEHU RI \HDUV LQ WKH SHULRG LQFUHDVHV WKL

DIWHU UHVWUXFWXULQJ DQG QRQH[LVWHQW LQ D SHULRG F

&ROXPQV   LGHQWLI\ WKH WLPLQJ RI WKLV HIIHFW &R

EHWZHHQ SUH   DQG SRVW   ZLWK WKH VLJQLILFDQFH

QHJDWLYH HIIHFW DIWHU   LV VWLOO VWURQJ &ROXPQ

ZLWK VLPLODU UHVXOWV &OHDUO\ WKHUH LV D QHJDWLY

FRQVWUXFWLRQ SRVW   +RZHYHU WKLV GRHV QRW OHDY

ZDV DOVR VXEVWLWXWLQJ IRU &7 SODQWV GXULQJ WKH ERR

ERRP SHULRG   DQG WKH QRQ ERRP SUH   DQG S

RQ WKH UHVWUXFWXULQJ YDULDEOH VKRZV WKHUH LV QRW

SODQWV 7KHUHIRUH LW¶V VDIH WR FRQFOXGH WKDW &7 S

EHFDXVH RI WKH H[SDQVLRQ LQ &&*7 SRZHU SODQWV

$QDO\VLV

7KH UHVXOWV LQ 7DEOHV   DQG   DWWULEXWH D VLJQL

ZLWK UHVWUXFWXULQJ OHDGLQJ WR DQ H[FHVV LQ &&*7 FD

IRFXVHG RQ WKH DGRSWLRQ RI QHZ WHFKQRORJ\ WKH LPS

QDWXUDO JDV PDUNHWV LQFUHDVLQJ HOHFWULFLW\ GHP

FRQVWUXFWLRQ WLPH RI JDV SODQWV :KLOH PDQ\ IDFWRUV

WKH JHRJUDSKLF GLIIHUHQFHV RI WKH SUHYLRXV H[SODQD

(DFK RI WKHVH LVVXHV DUH DGGUHVVHG LQ WKH IROORZLQJ

7KH LQWURGXFWLRQ RI ERWK FRPELQHG F\FOH DQG M

PDUNHWV KDG DQ LPSDFW RQ WKH FRVW RI SRZHU SODQW

FRVW RI FDSLWDO GHFOLQHG GXH WR WKRUQFVWHHDGYSHODFQHWLY

LQWURGXFWLRQ RI MHW HQJLQH WHFKQRORJ\ QRW RQO\ UH

EXW DOVR GHFUHDVHG WKH VWDUW XS WLPH ZKLFK LV LPS

WKHVH WHFKQRORJLHV ORZHUHG WKH OHYHOL]HG FRVW RI

IRU WKH ILUVW WLPH +RZHYHU WKLV GRHVQ¶W H[SODLQ W

ZHUH FRQVWUXFWHG LQ -DSDQ WKH 8. DQG WKH 86 EHJLQ

FRQWULEXWHV WR H[SODLQLQJ ZK\ WKH PDMRULW\ RI SRZH

7KH DELOLW\ RI JDV ILUHG SRZHU SODQWV WR EH EXLO

WKH FKRLFH RI IXHO DQG WHFKQRORJ\ 7KLV LV HVSHFLDO

ORDG YDULDQFH DQG IRU WKRVH ZKRVH PDUNHWV DUH OLEI

&7 SODQW LV \HDUV ZKLOH D JDV && SODQW FDQ EH EXLO

ZKLFK FDQ WDNH   RU PRUH \HDUV DQG QXFOHDU ZKLFK

VXSSRVHG WR SURYLGH -RVNRZ   6HFWLRQ   SURYLGHV

FRXOG KDYH OHG WR RYHULQYHVWPHQW LQ QHZO\ OLEHUDO

([SODLQLQJ WKH &7 %RRP

7KH LQFUHDVH LQ &&*7 FDSDFLW\ ZDV WKH PRVW VLJQ

7KH W\SLFDO FRQVWUXFWLRQ WLPH IRU D &7 SODQW LV \H

DQG QXFOHDU $V)LJXUH   VKRZV WKHUH ZDV D ODUJI

$VVXPLQJ D   \HDU ODJ EHWZHHQ WKH VWDUW RI SODQQL

RSHUDWLRQ WKH UHOHYDQW WLPH SHULRG ZKHQ DQDO\]LQ

7KH WLPLQJ DQG SDWWHUQ RI WKH &7 EXLOGRXW VKR

DVVXPSWLRQ WKDW XWLOLWLHV DGG SHDNLQJ FDSDFLW\ D

DGGLWLRQV WKURXJKRXW WKH \HDUV ZKLFK ZRXOG DSSHI

DFWXDO EXLOGRXW GLIIHUV IURP WKLV OLQHDU SURMHFWL

SULRU WR   PRUH DGGHG EHWZHHQ   DQG   DQG OH

SHULRG LV PRVW HDVLO\ H[SODLQHG DV LW ZDV LPSDF

*DV &7 SRZHU SODQWV DUH EXLOW WR PHHW SHDN ORD
VXPPHU LQ WKH ODWH DIW7HKUHQURRRORHQD GVKDUURX\XHHRULWWQKJ G
GHPDQG SHDNV DV IDPLOLHV UHWXUQ KRPH DQG WXUQ RQ
LQYHVWPHQW LQ SHDNLQJ SODQWV E\ XWLOLWLHV LV VH
H[SHFWDWLRQV (,$　　　　2Q WKH RWKHU KDQG LQFUHDVHV
WKH ORDG FXUYH DV WKH\ SHDN GXULQJ WKH ODWH PRUQL
　　)LJXUH　　VKRZV WZR WUHQGV ZKLFK VLJQLILFDQWO\
XWLOLWLHV 7KH ILUVW LV WKH LQFUHDVH LQ UHVLGHQWL
FRLQFLGHG ZLWK D GURS LQ H[SHFWDWLRQV DERXW WKH
GHPDQG GXULQJ WKH GD\ DQG H[SDQG LW DV HYHQLQJ DS
SODQWV　7KH VHFRQG WUHQG LV WKH ODUJH LQFUHDVH LQ
　　DQG WKH EHJLQQLQJ RI WKH GHFOLQH LQ UHVLGHQWLD
WKHVH IDFWRUV ZRXOG KDYH IODWWHQHG WKH ORDG FXUY

　　　　)LJXUH　　(,$　　<HDU 3URMHFWLRQV RI (56 *URZWK E\

　　　6RXUFH (,$

'HVSLWH FKDQJHV LQ (56 VHFWRU SURMHFWLRQV DQ L

WKH RLO WR JDV IXHO UDWLR GXULQJ WKH   V   WKH ODFN

7KH FRPELQDWLRQ RI FKDQJHV LQ VHFWRU (56 JURZWK
QDWXUDO JDV DORQJ ZLWK WKH LPSDFW RI WKH H[FHVV FD
FRQVWUXFWLRQ ERRP RI WKH ODWH   V DQG HDUO\   V

(QWU\ UHDFKHV DQ HTXLOLEULXP ZKHUH YDULDEOH SURILW
LQ WKH LQGXVWU\ IROORZLQJ HQWU\

)LJXUH   )LUP (QWU\ DQG &DSDFLW\ )DFWRUV LQ 5HVW

6RXUFH (,$)RUP   DQG $XWKRU¶V &DOFXODWLRQV

)LJXUH   VKRZV WKH DYHUDJH FDSDFLW\ IDFWRU IRU D
HOHFWULFLW\ SURGXFLQJ ILUPV LQ RSHUDWLRQ LQ WKDW \
SODQW VWDUWLQJ LQ   DQG FRQWLQXLQJ XQWLO   7K
QXPEHU RI ILUPV UHIOHFWV WKH OHYHO RI HQWU\ LQ WKL
HOHFWULFLW\ ZDV LQVXIILFLHQW WR SXUFKDVH WKH HOHF
WKH LQGXVWU\ 7KLV UHVXOW FRQILUPV D NH\ DVVXPSWLR

7KH VHFRQG SUHGLFWLRQ KDV D FULWLFDO LPSDFW RQ
PD[LPL]LQJ GHFLVLRQ WR HQWHU WKH LQGXVWU\ ,Q RUGH
LQGXVWU\ DW WKLV WLPH REVHUYHG ILUPV PXVW HDUQ D

7KLV PRGHO LV FRQVLVWHQW ZLWK ZKDW RFFXUUHG LQ
WKH ODWH   V ,Q SDUWLFXODU LW SURYLGHV DQ H[SODQ
WKDW ILUPV FRQWLQXHG WR LQYHVW HYHQ DIWHU REVHUYL
SURJUH$QV EDVLF IXQGDPHQWDO DQDO\VLV ZRXOG KDYH FRQ
VLJQLILFDQWO\ ZKLFK LV ZKDW RFFXUUHG /RZHU FDSDFLW
SD\ WKH FRVW RI FDSLWDO FRQVWUXFWLRQ +RZHYHU LI
HQWU\ ZRXOG FRQWLQXH *LYHQ WKH HYHQWV LQ WKH WL
PDUNHWV LQ WKLV WLPH SHULRG WKLV VKRXOG QRW EH VX

0RGHO   )LUVW 0RYHU

,Q WKH HOHFWULFLW\ JHQHUDWLRQ VHFWRU LQYHVWP
HFRQRPLHV RI VFDOH $V D UHVXOW D ILUP FRXOG JDLQ D
PDNLQJ D ODUJH XSIURQW LQYHVWPHQW ,Q RUGHU WR SUH
RWKHU ILUPV WKDW HQWHULQJ WKH PDUNHW ZLOO RQO\ LQ

/RYDOOR   ILUPV DEDQGRQHG D IXQGDPHQWDO DQDO\VL

WKH IDG ZDV WDNLQJ DGYDQWDJH RI QHZO\ GHUHJXODWH

VWUDWHJ\ OHG WR H[FHVV FDSDFLW\ LQ UHVWUXFWXUHG VV

7DEOH   0RGHO 3UHGLFWLRQ 2XWFRPHV

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t Œr}(r ššŒ]š]9v	8	9	
}vš P]}v	9	9	9
&]Œ•šrD}À Œ	8	9	8

:KLOH WKH FRPELQDWLRQ RI D FRRUGLQDWLRQ IDLOX
LPSRUWDQW IDFWRUV LQ WKH JDV ERRP LW¶V LPSRUWDQW
JDV ERRP WRRN SODFH LQ WKH 86 DW WKH HQG RI WKH 'R
EXEEOH 7KLV LV QRW D FRLQFLGHQFH 7KH SHULRG
WKH QDWXUH RI JOREDO ILQDQFLDO PDUNHWV 3ULRU WR
$PHULFDQ DQG (DVW $VLDQ HFRQRPLHV +RZHYHU WKH H[S
WKH 7HTXLOD &ULVLV LQ 0H[LFR WKH $VLDQ)LQDQFLDO &U
$PHULFD 6RXWK $PHULFD DQG 5XVVLD VKLIWHG WKH IORZ R
DQG LQWR WKH GHYHORSLQJ PDUNHWV RI (DVWHUQ (XURSH
DQG WKH 8QLWHG 6WDWHV (LFKHQJUHHQ   7KLV IORZ
UHGXFHG LQYHVWPHQW E\ WKH SUHYLRXVO\ ERRPLQJ $VLDQ
H[FKDQJH UDWH YXOQHUDELOLW\ 7KH HIIHFW RI WKHVH FK
6WDWHV DQG ZDV GXEEHG WKH ³$VLDQ 6DYLQJV *OXW´ E\ %
RI JOREDO UHDO LQWHUHVW UDWHV OHG WR D IORZ RI FKH
FRXQWULHV LQFOXGLQJ WKH 86 $W WKH VDPH WLPH D FRR
DQG WKH LQWURGXFWLRQ RI QHZ WHFKQRORJ\ FUHDWHG D
8QLWHG 6WDWHV 7KHVH RSSRUWXQLWLHV ZHUH UHIOHFWH
6WDWHV LQ WKH ODWH   V DQG HDUO\   V

7KH OLQN EHWZHHQ ORQJ UXQ LQWHUHVW UDWHV DQG
OLWHUDWXUH 0XQGHOO $V LQWHUHVW UDWHV GHFOLQ
LQYHVWPHQW ERRP RFFXUV $V &DEDOOHUR HW DO   G

UHODWLRQVKLS EHWZHHQ ORZHULQJ JOREDO LQWHUHVW UD

HOHFWULFLW\ LQGXVWU\ GHFOLQLQJ H[SHFWDWLRQV DERX

IRU EXLOGLQJ QHZ SRZHU SODQWV 7KLV LQFUHDVHG SUR

HOHFWULFLW\ LQGXVWU\ LQ SDUWLFXODU WKRVH ZKRVH S

ORQJ UXQ 7KLV OHDYHV WKH LQGXVWU\ RSHQ WR VSHFXO

RQH RI WKH HIIHFWV +RZHYHU LI UDWHV EHJLQ WR ULVH

0XFK KDV EHHQ ZULWWHQ DERXW WKH VXEVHTXHQW EX

DQG KRXVLQJ EXW WKH DYDLODELOLW\ RI FKHDS FUHGLW

EIQSGDG\VRRQ •RÀ LDOYHVWPHQW LQ WKH HOHFWULFLW\ LQGXVV

0LDQ DQG 6XIL 1RPLQDO \HDU VRYHUHLJQ \LHOGV

FRXQWULHV DYHUDJHG QLQH SHUFHQW LQ DQG IRXU SH

FLWH FKHDS FUHGLW DV IDFLOLWDWLQJ WKH LQYHVWPHQW

&DOSLQH D ODUJH EXLOGHU DQG RSHUDWRU RI JDV ILUHG

ERUURZLQJ GXULQJ D SHULRG ZKHUH FUHGLW ZDV FKHDS 7

+RZHYHU ORZ LQWHUHVW UDWHV E`HPx7D ZHY O •0`V ð

6\QWKHWLF &RQWURO

7KH VWDJJHUHG DQG LQFRPSOHWH DGRSWLRQ RI UHVV
FRXQWHUIDFWXDO IRU WKH UHVWUXFWXUHG VWDWHV   +RZH
LQ D PRUH SUHFLVH PDQQHU $SSO\LQJ WKH PHWKRG SUH
$EDGLH DQG *DUGHD]DEDO $EDGLH HW DO   %XFKPX
GLYLGHG LQWR UHVWUXFWXUHG DQG GRQRU JURXSV   )RU H
FRXQWHUIDFWXDO VWDWH IURP WKH GRQRU JURXS ZKLFK V
KDYH EHHQ DGGHG LQ WKH UHVWUXFWXUHG VWDWH LI UHVV
LQ $EDGLH HWWEDO FKDQJH LQ &&*7 FDSDFLW\ FDQ EH ZULWW

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<ᵢₜLV WKH FKDQJH LQ &&*7 FDSDFLW\ IRŕ¹ᵣUHWWᵗWᵏXᵡ
FRXQWHUIDFWXDO FKDQJH LQ &&*7 FDSₐᵢᵗWₜWᵏᵣU ᴵᵐᵖₐᶜWᵗ
UHVWUXFWXULQJ RQ LQYHVWPHQW LQ &&*7 FDSDFLW\   &DO
SDSHU   UHTXLUHᵢₑˢ ₐₗₙₒₓ ₗₒₒₗₒₙᵒᵂₙ OHₐᵗWᵒ ₙᵍᵉᵒₙ ₗₜᵐₐᵗWₑG (VW
UHTXLUHV WKUHH LQSXWV   ,PSRUWDQW IDFWRUV ZKLFK
UHODWLYH LPSRUWDQFH RI HDFK RI WKRVH IDFWRUV   7K

7KH LPSRUWDQW IDFWRUV LQ FKDQJHV LQ &&*7 FDSDF
VWDWHV ZLWK WKH VWDWHV ZKLFK WKH\ PRVW FORVHO\ UH
VHOHFWHG IURP LQVLJKWV LQ WKH LQGXVWULDO OLWHUDWX
DQG LQFOXGH (56 SURMHFWLRQV FDSDFLW\ WR (56 UDWL

WKH FKRVHQ FRXQWHUIDFWXDO VWDWHV DUH RI HTXDO LI

FRXQWHUIDFWXDO VWDWH LV IRU ᵢPLHVGPIHRDVHNDFHG UHVWUXFWX

(VWLPDWLQJ WKH V\QWKHWLF FRQWURO JURXS UHTXLU

SUHYLRXV VWXGLHV WKH RXWFRPH YDULDEOH KDV EHHQ

VWHUUHHQJWWKFX RWWWKLWOSDHSUHUU2Lᵖ\ᵖWKHJDGRSOWWLRᵥ\LROWᵥHMDUUXV

7KHUHIRUH WKHUH LV QRW RQH VWDWH IRU ZKLFK WR FRQ

WKH UHVHDUFKHU WZR RSWLRQV HVWLPDWH WKH DYHUDJH

V\QWKHWLF FRQWURO RI WKH DYHUDJH UHVWUXFWXUHG VV

UHVWUXFWXULQJ RFFXUUHG DW GLIIHUHQW WLPHV IRU GLI

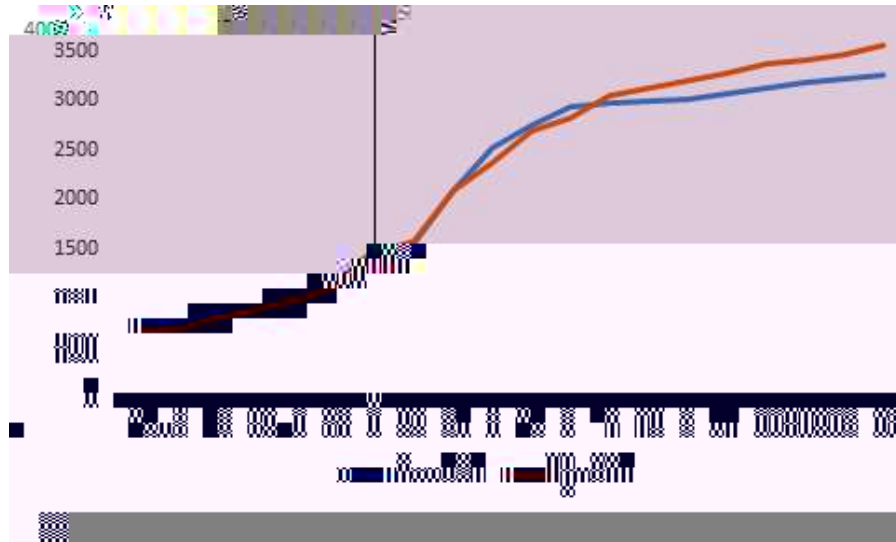ZKHHQWVKHWWVFXFFRVQXXUUHRGOLRQU@LYHHK&2 `UH PWLGLROᵥQ₀€WWUXIFMWX

)LJXUH $YHUDJH 5HVWUXFWXUHG DQG 6\QWKHWLF &RQW

1RWHV 5XQQLQJ YDULDEOH LV \HDUV VLQFH VWDWH VWDUWHG UHV

)LJXUH   VKRZV WKH DYHUDJH QHW FDSDFLW\ LQ 0: DGG
FRPSDUHG WR WKH HVWLPDWHG FRXQWHUIDFWXDO 7KH WU
EHJLQV DW WLPH]HUR EXW LV ODJJHG WKUHH \HDUV)RO
GHSDUWXUH EHWZHHQ WKH RXWFRPHV IRU WKH WZR JURXS
UHVWUXFWXUHG VWDWHV ZRXOG KDYH EHHQ H[SHFWHG WR

7DEOH   FRPSDUHV WKH V\QWKHWLF FRQWURO UHVXOWV ZL

VKRZV WKH DPRXQW RI &&*7 FDSDFLW\ 0: DGGHG LQ UHVW

FRQWURO IRU WKH SHULRG GHILQHG E\ WKH YDULDEOH 7K

WKH \HDUV RXWVLGH WKH SHULRG VSHFLILHG 7KH WKLUG

GLIIHUHQFH LQ GLIIHUHQFH 7KH PDLQ VSHFLILFDWLRQ RI

YDULDEOH %RRP 7KLV LV VLPLODU WR ZKDW ZDV HVWLPDW

    7KH SHULRG UHVXOWV DUH LQFOXGHG WR DFFXUDWHO

VWDWHV VWDUWHG 7KHLVWWLUXXFFWWXXFUROQXJPLQQSHULRG UHVXOW V

EHWZHHQ FDSDFLW\ DGGHG E\ UHVWUXFWXUHG VWDWHV D

VWDWHV IRU IRXU \HDUV DIWHU UHVWUXFWXULQJ 3HULRGV

\HDUV DIWHU UHVWUXFWXULQJ 7KH VHFRQG FROXPQ VKRZ

Notes Running variable is years since state started

Synthetic control has matched restructured al
treatment Figure   The close relationshp betw
suggesting that restructuring did not change inv
years after restructuring the difference between
CT capacity widens by a small amount This suggests
period experienced reduced Gas CT investment re
restructuring The interpretation of the small ga
bidding markets of the large number of CCGT plants

A New Approach to Synthetic Control

To date this study represents a new use of syn
treatment states and its application to the ele
was used for one treated group like the state of
previously this is a complication for multiple tr
states into one group and estimating the synthet
strength of the approach taken here is it allows
counterfactuals are estimated using state specif
As a result this paper doesn¶t suffer from the est

$OWHUQDWLYH 6SHFLILFDWLRQV

7KH WKHVLV RI WKLV SDSHU LV QRW WKDW UHVWUXFWX
FDSDFLW\ EXW D WHPSRUDU\ VXUJH ZKLFK GHFOLQHG DV W
UHIOHFWV WKLV G\QDPLF WUHQG EHWZHHQ SHULRGV +RZH
ZKLFK FDQ EH XVHG WR DQDO\]H FKDQJHV LQ VSHFLILFDWLR
ERRP   DQG QRQ ERRP DOO RWKHU \HDUV 7KH LQV
UHVWUXFWXULQJ DOORZV WKH LPSDFW WR EH VHSDUDWHG
UHVWUXFWXULQJ YDULDEOH UHIHUV WR UHVWUXFWXUHG VV

1RW VXUSULVLQJO\ WKLV LV ODUJH LQ ERWK PDJQLWXGH
GRHVQ¶W SURYLGH LQVLJKW LQWR LQYHVWPHQW SDWK &R
VLJQLILFDQW LPSDFW RI UHVWUXFWXULQJ RQ &&*7 LQYHV
GHPDQG SURMHFWLRQV DQG FRVW UDWLRV DUH H[FOXGHG
H[SODLQLQJ WKH ERRP YDULDEOH ZKLFK LV WKH DPRXQW

< < LQYHVWHG EH\RQG WKH PLQLPXP UHTXLUHPHQW LV D

E\ HDFK ILUP LQ HDFK SHULRG WKHUHIRUH LV 4 ; < ,W¶V

RSHUDWH ZLWKLQ WKH VDPH SHULRG 'HPDQG IRU DOOFWUL

GHPDQG IRU WKH DOWHUQDWLYHLWJRR'G [UHSDUGGHQ¶WHG E\D'

FKDUJHV D XQLIRUP SULSHDORQGUHHDFKVOERURRISHDEK JRRG 7

ZHOIDUH IRU HDFK PDUNHW FDQ WKHQ EH ZULWWHQ DV IRO

$$9 \, {}^{Ë} L \pm \&^{Ë}{:}T_5; F \, L^{Ë} E \, \hat{I} \, {}^{Ë}_5{:}T_5;@_5TE \pm \&^{Ë}{:}T_6; F \, L$$

$VVXPSWLRQ: 6

2QFH WKHVH DVVXPSWLRQV DUH LPSOHPHQWHG LQ WKL

$SSHQGL[IRU GHWDLOV WKH IROORZLQJ ZHOIDUH LPSDF

¿9 L ± L_6 F &

:HOIDUH (II H&T; F9Ãá Ã6 2Ë TË F TÌ FË F Ì
    U @ 50 @ 5ôü5ôü 5ôü 5ô 5ôü 5ôü

    7KLV LV WKH FKDQJH LQ ZHOIDUH IURP UHVWUXFWXULQ

LQ WKH SULFH RI HOHFWULFLW\   7KH WZR FRPSRQHQWV R

FRPSRQHQWV RI HOHFWULFLW\ SURGXFWLRQ ,I UHVWUXFW

LQWHQGHG WR GR FRQVXPHUV ZRXOG UHVSRQG E\ SXUFK

GLIIHUHQFH⁵ DQG ZHHQ ;

    :HOIDUH ,PSDFW (VWLPDWLRQ

    2I WKH IRXU ZHOIDUH HIIHFWV LGHQWLILHG DERYH W

H[FHVVLYH HQWU\ RQ ZHOIDUH VR RQO\ , DQG ,9 ZLOO EH H

DUH QRW GLUHFWO\ UHODWHG WR H[FHVVLYH HQWU\

    (IIHFW ,

,Q RUGHU WR FDOFXODWH WKH WRWDO ZHOIDUH FKDQJH IU

JRRG PDUNHW LW¶V ZRUWK QRWLQJ WKDW WKH HFRQRP\ LV

D Q:ġ6

RI SODQW UHWLUHPHQWV &&*7 ZDV QHZO\ LQWURGXFHG LQ

&7 SODQWV ZHUH EXLOW XQWLO WKH   V VR SODQW UHWL

RQ WR WKH FRQVXPHU LQ W&HWIKRIUPFRODVKILJWKH SRVLFHVRI W

WKH ILUPV DV FRQVXPHUV ZHUH LQVXODWHG IURP LQYHV

FRPSHWLWLRQ :KLOH WKH LPSDFW RQ ILUPV ZRXOG DIIH

UHVRXUFHV LW GLGQ¶W KDYH WKH VDPH HIIHFW DV LQ WKH

    :KLOH -RVNRZ ZDV FHUWDLQO\ FRUUHFW WKDW &265 LQ

LQWHQVLYH PHWKRGV RI HOHFWULFLW\ JHQHUDWLRQ WKHU

FRVW RI H[FHVV LQYHVWPHQW FDQ EH ODUJH DV HYLGHQF

WKH ODVW \HDUV 6HFRQG ZKLOH &265 LQFHQWLYL]HV

HOHFWULFLW\ PDUNHWV HQFRXUDJH ILUPV WR XQGHULQYH

H[SHFWDWLRQV SOD\ D ODUJH UROH LQ WKH FRQVWUXFWL

PLQLPL]HG E\ WKH DELOLW\ RI XWLOLWLHV WR UHFRXS WKH

7KLV LV SUHFLVHO\ ZK\ DQ\ QHZ QXFOHDU DGGLWLRQV DUH

JXDUDQWHHV +RZHYHU PDNLQJ D ODUJH LQYHVWPHQW LQ

YHQWXUH DQG ILUPV PD\ RSW IRU OHVV FDSLWDO LQWHQVL

KLJKHU OHYHOL]HG FRVW ,W¶V QRW VXUSULVLQJ WKHUHIR

FKRVHQ RYHU FRDO DQG QXFOHDU SODQWV :KLOH WKHVH O

ZKHQ JDV SULFHV ZHUH ORZ WKH KLJK JDV SULFHV RI WKH

    (IIHFW ,9

    7KH FKDQJH LQ ZHOIDUH IURP HIIHFW ,9 LV GHSHQGH

HOHFWULFLW\ SULFHV DQG WKH HODVWLFLW\ RI HOHFWULF

KDYH LQFUHDVHG RU GHFUHDVHG DV D UHVXOW RI UHVWUX

DQG FRQVWUXFWLRQ PDWHULDOV SULFHV LV GLIILFXOW V

LVRODWH RQO\ WKH HIIHFW RQ HOHFWULFLW\ SULFHV RI U

DQG WKUHH LQFUHDVLQJ HIIHFWV

    7KHUH DUH WZR FKDQQHOV IRU UHVWUXFWXULQJ OHDG

UHGXFWLRQ LQ FRQVWUXFWLRQ DQG RSHUDWLRQ FRVWV IU

*LYHQ D GRZQZDUG VORSLQJ GHPDQG FXUYH DQG FRPSHW

VDYLQJV RQ WR FRQVXPHUV LQ WKH IRUP RI ORZHU SULFHV

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5 H I H U H Q F H V

%HUU\ 6WHYHQ DQG :DOGIRJHO -RHO ³)UHH (QWUV

%URDGFDVWL-RXUQDO RI (FRQRPLFV

%HU]HO <RUDP ³7KH 3URGXFWLRQ)XQFWLRQ DQG 7K

,QGXVWUWRXUQDO RI 3ROLWLFDO (FRQRP\

)HGHUDO (QHUJ\ 5HJXODWRU\ &RPPLVVLRQ)(5& ZZZ I

)LQDQFLDO &ULVLV ,QTXLU\ &RPPLVVLRQ ³7KH)LQD
*RYHUQPHQW 3XEOLVKLQJ 2IILFH &

)RZOLH 0HUHGLWK ³(PLVVLRQV 7UDGLQJ (OHFWULF
3ROOXWLRQ $SHDULHFPHQQ(FRQRPLF 5HYLHZ

*HURVNL 3 $ DQG 0D]]XFDWR 0 ³0RGHOOLQJ WKH '\
,QWHUQDWLRQDO -RXUQDO RI ,QGXVWULDO 2UJDQL]DWLRQ

*LOEHUW 5LFKDUG DQG 9LYHV ;DYLHU ³(QWU\'HWHUU
RI (FRQRPLF 6WXGLHV

+LONH -RKQ ³([FHVV &DSDFLW\ DQG-RXUQDO6RPHQ (PSXV
(FRQRPLFV

+REEV %HQMDPLQ ³2SWLPL]DWLRQ 0HWKRGV IRU (O
(XURSHDQ -RXUQDO RI 2SHUDWLRQDO 5HVHDUFK

,QWHUQDWLRQDO $WRPLF (QHUJ\ $JHQF\ ZZZ LDHD RUJ

,VKLL -XQ DQG <DQ -LQJPLQJ ³'RHV 'LYHVWLWXUH &U
%X\ 'HFLVLRQ LQ WKH 8 6 (OHFWUL'F-LRXUQDOHDOH DDWLRRQRPOLG

-RVNRZ 3DXO ³5HVWUXFWXULQJ &RPSHWLWLRQ DQG
6HFW-RRXUQDO RI (FRQRPLF 3HUVSHFWLYHV

-RVNRZ 3DXO ³,QFHQWLYH 5HJXODWLRQ LQ 7KHRU\ D
7UDQVPLVVLRQ(1HWZ RRUNLQ JV :RUQLQ&HOOSHU

-RVNRZ 3DXO ³/HVVRQV /HDUQHG IURPQ(OHUJF\VEXFULQD\O
6SHFLDO ,VVXH

-RVNRZ 3DXO ³&RPSDULQJ WKH &RVWV RI ,QWHUPLWWL
7HFKQRORSPJHULHVFDQ (FRQRPLF 5HYLHZ 3DSHUV DQG 3URFHHG

-RVNRZ 3DXO DQG .DKQ (GZDUG ³$ 4XDQWLWDWLY
&DOLIRUQLD¶V :KROHVDOH (OHFWUL(QLHWJ\ 0DURXXUHQQDDOOXULQJ 6X

-RVNRZ 3DXO DQG 0LVKNLQ)UHGHULF ³(OHFWULF 8W
6WDWWOQHH'UQDWLRQDO (FRQRPLF 5HYLHZ

-RVNRZ 3DXO DQG 6FKPDOHQVHH 5LFKDUG ³0DUNHWV IRU
'HUHJXODWLRQ0´7&DPEVVGJH

-RYDQRYLF %R\DQ ³6HOHFWLRQF DDQQGGPWKWHKHULF\ (ROYXROXWLRQ

-RYDQRYLF %R\DQ DQG 0DF'RQDOG *OHQQ ³7KH /LIH
-RXUQDO RI 3ROLWLFDO (FRQRP\

.DKQ (GZDUG   ³5HJXODWLRQ E\ 6LPXODWLRQ 7KH 5R
(OHFWULFLW\ 3ODQ QHDW DORQJ 3U5LFLQDUFK

.DSODQ 6WDQ   ³'LVSODFLQJ &RDO ZLWK *HQHUDWLRQ
3ODQ &56 5HSRUW IRUJD&RQJUHVV

.OHSSHU 6WHYHQ   ³(QWU\ ([LW *URZWK DQG ,QQRY
$PHULFDQ (FRQRPLF 5HYLHZ

.OHSSHU 6WHYHQ DQG 0LOOHU -RKQ   ³(QWU\ ([LW DQ
0DQXIDFWXUH ,QWURGXFWLRQDO -RXUQDO RI ,QGXVWUL 0,

1DWLRQDO 5HQHZDEOH (QHUJ\ /DERUDWRU\ 15(/   /HY

ZZZ QUHO JRY

1RUGLQ - $ ³1RWH RQ D /L(FRWR3PHDWQLUL¶FD &RVW &XUYHV

1XFOHDU (QHUJ\ ,QVWLWXWH   KWWS ZZZ QHL RUJ

3DXO $QWKRQ\ 0\HUV (ULFD DQG 3DOPHU .DUHQ   ³
(OHFWULFLW\ 'HPDQG E\ 5HJ5LRQL6FXWRLRQDO DQGSHUFWRU ´

3HUU\ 0 .   ³6FDOH (FRQRPLHV ,PSHUIHF-WRX&URQPSOHWRLW
,QGXVWULDO (FRQRPLFV

3HWHUVRQ 3DXO DQG :LOVRQ 5DFKHO   ³$ %ULHI 6XUY
5XOHV DQG 5H$TXXHHUHLPPHDQOW&OHDQ 6NSLHUVL,OQRXQGDWLRQ

:KLFK FDQ WKHQ EH VHSDUDWHG LQWR WKH IROORZLQJ ILY

$$\pm \underset{6}{L}\, F\, \&{:}T_6\,; E\,\acute{I}\quad ?\underset{6}{\overset{\grave{J}}{U}}\overset{\grave{J}}{6}\underset{\ddot{U}}{}F\, L\underset{6}{\overset{\grave{J}}{U}}\overset{\grave{J}}{6}\ddot{U}E\,\acute{I}\,\acute{I}k\quad ?\overset{\grave{J}}{5}\hat{o}F\,?\overset{\ddot{E}}{5}\hat{o}\ddot{U}T\overset{\grave{J}}{5}\hat{o}E\,\acute{I}\,\acute{I}k\quad \textcircled{5}\hat{o}F\,\textcircled{5}\hat{o}\ddot{U}:\overset{\grave{J}}{5}\hat{o}\ddot{U}$$

$$E \pm \&{:}T_5\,; F\,\acute{I}\,\acute{I}\quad ?\overset{\ddot{E}}{5}\hat{o}\ddot{U}\overset{\ddot{E}}{5}\hat{o}F\,T\overset{\grave{J}}{5}\hat{o}\ddot{U}F\,\textcircled{5}\hat{o}\ddot{U}\overset{\ddot{E}}{5}\hat{o}\ddot{U}F$$

'LVDJJUHJDWLQJ WKLV UHVXOW E\ WHFKQRORJ\ WKH IL