**Online Appendix**

**Parameter estimates**

| Para- meters | Definitions | Est. Values | Source |
| --- | --- | --- | --- |
| $$η\_{b}^{r}$$ | Own price elasticity of beef demand at the retail level | -0.70 | Brester, 1996 |
| $$η\_{b}^{w}$$ | Own price elasticity of beef demand at the processing level | -0.57 | Marsh,1992 |
| $$η\_{b}^{s}$$ | Own price elasticity of slaughter cattle demand at the feedlot level | -0.66  | Marsh,1992 |
| $$η\_{b}^{f}$$ | Own price elasticity of feeder cattle demand at the farm level | -0.62 | Marsh,1992 |
| $$η\_{bp}^{r}$$ | Cross elasticity of beef demand with respect to price of pork at the retail level | 0.19 | Brester, 1996 |
| $$η\_{bk}^{r}$$ | Cross elasticity of beef demand with respect to price of poultry at the retail level | 0.05 | Brester, 1996 |
| $$η\_{p}^{r}$$ | Own price elasticity of pork demand at the retail level | -0.79 | Brester, 1996 |
| $$η\_{p}^{w}$$ | Own price elasticity of pork demand at the processing level | -0.71 | Brester et al., 2004 |
| $$η\_{p}^{f}$$ | Own price elasticity of hog demand at the farm level | -0.51 | Wohlgenant, 1989 |
| $$η\_{pb}^{r}$$ | Cross elasticity of pork demand with respect to price of beef at the retail level | 0.34 | Brester, 1996 |
| $$η\_{pk}^{r}$$ | Cross elasticity of pork demand with respect to price of poultry at the retail level | 0.02 | Brester, 1996 |
| $$η\_{k}^{r}$$ | Own price elasticity of poultry demand at the retail level | -0.29 | Brester, 1996 |
| $$η\_{k}^{w}$$ | Own price elasticity of poultry demand at the processing level | -0.22 | Brester et al., 2004 |
| $$η\_{kb}^{r}$$ | Cross elasticity of poultry demand with respect to price of beef at the retail level | 0.18 | Brester, 1996 |
| $$η\_{kp}^{r}$$ | Cross elasticity of poultry demand with respect to price of pork at the retail level | 0.04 | Brester, 1996 |
| $$η\_{e}$$ | Own price elasticity of ethanol demand | -0.43  | Elobied and Tokgoz , 2008 |
| $$η\_{co}^{b}$$ | Elasticity of corn demand by beef sector with respect price of corn  | -0.19 | Authors’ estimation[[1]](#footnote-1) |
| $$η\_{co,sym}^{b}$$ | Cross elasticity of corn demand by beef sector with respect price of soymeal | 0.29 | Authors’ estimation |
| $$η\_{co,DG}^{b}$$ | Cross elasticity of corn demand by beef sector with respect price of DG | -0.31 | Authors’ estimation |
| $$η\_{co}^{p}$$ | Elasticity of corn demand by hog sector with respect price of corn  | -0.14 | Authors’ estimation |
| $$η\_{co,sym}^{p}$$ | Cross elasticity of corn demand by hog sector with respect price of soymeal  | 0.24 | Authors’ estimation |
| $$η\_{co,DG}^{p}$$ | Cross elasticity of corn demand by hog sector with respect price of DG | -0.36 | Authors’ estimation |
| $$η\_{co}^{k}$$ | Elasticity of corn demand by poultry sector with respect price of corn  | -0.21 | Authors’ estimation |
| $$η\_{co,sym}^{k}$$ | Cross elasticity of corn demand by poultry sector with respect price of soymeal | 0.29 | Authors’ estimation |
| $$η\_{co,DG}^{k}$$ | Cross elasticity of corn demand by poultry sector with respect price of DG | -0.32 | Authors’ estimation |
| $$η\_{co}^{e}$$ | Elasticity of corn demand by ethanol sector with respect price of corn  | 0 | Fixed prop. relation[[2]](#footnote-2)  |
| $$η\_{sym}^{b}$$ | Elasticity of soymeal demand by beef sector with respect price of soymeal  | -0.32 | Authors’ estimation |
| $$η\_{sym,co}^{b}$$ | Cross elasticity of soymeal demand by beef sector with respect price of corn | 0.15 | Authors’ estimation |
| $$η\_{sym,DG}^{b}$$ | Cross elasticity of soymeal demand by beef sector with respect price of DG | 0.09 | Authors’ estimation |
| $$η\_{sym}^{p}$$ | Elasticity of soymeal demand by hog sector with respect price of soymeal | -0.05 | Authors’ estimation |
| $$η\_{sym,co}^{p}$$ | Cross elasticity of soymeal demand by hog sector with respect price of corn | 0.1 | Authors’ estimation |
| $$η\_{sym,DG}^{p}$$ | Cross elasticity of soymeal demand by hog sector with respect price of DG | 0.05 | Authors’ estimation |
| $$η\_{sym}^{k}$$ | Elasticity of soymeal demand by poultry sector with respect price of soymeal  | -0.22 | Authors’ estimation |
| $$η\_{sym,co}^{k}$$ | Cross elasticity of soymeal demand by poultry sector with respect price of corn | 0.14 | Authors’ estimation |
| $$η\_{sym,DG}^{k}$$ | Cross elasticity of soymeal demand by poultry sector with respect price of DG | 0.07 | Authors’ estimation |
| $$η\_{sy}^{ }$$ | Own price elasticity of soybean demand | -0.37 | Gerlt, 2013 |
| $$η\_{sy,sym}^{ }$$ | Cross price elasticity of soybean demand with respect to soymeal demand | 0.25 | Gerlt, 2013 |
| $$η\_{DG}^{b}$$ | Elasticity of DG demand by beef sector with respect price of DG  | -0.79 | Authors’ estimation |
| $$η\_{DG,co}^{b}$$ | Cross elasticity of DG demand by beef sector with respect price of corn | 0.4 | Authors’ estimation |
| $$η\_{DG,sym}^{b}$$ | Cross elasticity of DG demand by beef sector with respect price of soymeal | 0.24 | Authors’ estimation |
| $$η\_{DG}^{p}$$ | Elasticity of DG demand by hog sector with respect price of DG | -0.8 | Authors’ estimation |
| $$η\_{DG,co}^{p}$$ | Cross elasticity of DG demand by hog sector with respect price of corn | 0.38 | Authors’ estimation |
| $$η\_{DG,sym}^{p}$$ | Cross elasticity of DG demand by hog sector with respect price of soymeal | 0.23 | Authors’ estimation |
| $$η\_{DG}^{k}$$ | Elasticity of DG demand by poultry sector with respect price of DG | -0.77 | Authors’ estimation |
| $$η\_{DG,co}^{k}$$ | Cross elasticity of DG demand by poultry sector with respect price of corn | 0.39 | Authors’ estimation |
| $$η\_{DG,sym}^{k}$$ | Cross elasticity of DG demand by poultry sector with respect price of soymeal | 0.2 | Authors’ estimation |
| $$η\_{co}^{x}$$ | Corn export demand elasticity | -1.11 | Remier et al. 2012 |
| $$η\_{sym}^{x}$$ | Soybean meal export demand elasticity | -1.41 | Piggot and Wohlgenant, 2001 |
| $$η\_{sy}^{x}$$ | Soybean export demand elasticity | -0.90 | Remier et al. 2012 |
| $$η\_{DG}^{x}$$ | DG export demand elasticity | 2 | Expert opinion |
| $$η\_{e}^{m}$$ | Ethanol demand elasticity with respect to mandate | 1 | See footnote 21 in the main text |
| $$ε\_{b}^{r}$$ | Own price elasticity of beef supply at the retail level | 0.36  | Brester et al., 2004 |
| $$ε\_{b}^{w}$$ | Own price elasticity of beef supply at the processing level | 0.28  | Brester et al., 2004 |
| $$ε\_{b}^{s}$$ | Own price elasticity of slaughter cattle supply at the feedlot level | 0.26  | Marsh, 1994 |
| $$ε\_{b}^{f}$$ | Own price elasticity of feeder cattle supply at the farm level | 0.22 | Marsh, 2003 |
| $$ε\_{p}^{r}$$ | Own price elasticity of pork supply at the retail level | 0.73 | Brester et al., 2004 |
| $$ε\_{p}^{w}$$ | Own price elasticity of pork supply at the processing level | 0.44 | Brester et al., 2004 |
| $$ε\_{p}^{f}$$ | Own price elasticity of slaughter hog supply at the farm level | 0.41 | Lemieux and Wohlgenant, 1989 |
| $$ε\_{k}^{r}$$ | Own price elasticity of poultry supply at the retail level | 0.18 | Brester et al., 2004 |
| $$ε\_{k}^{w}$$ | Own price elasticity of poultry supply at the processing level | 0.14 | Brester et al., 2004 |
| $$ε\_{co}^{b}$$ | Elasticity of slaughter cattle supply with respect to price of corn | -0.02 | Meyers et al. 1992 |
| $$ε\_{sym}^{b}$$ | Elasticity of slaughter cattle supply with respect to price of soymeal | -0.003 | Meyers et al. 1992 |
| $$ε\_{DG}^{b}$$ | Elasticity of slaughter cattle supply with respect to price of DG | -0.002 | Expert opinion |
| $$ε\_{co}^{p}$$ | Elasticity of hog supply with respect to price of corn | -0.09 | Stoddart, 1991 |
| $$ε\_{sym}^{p}$$ | Elasticity of hog supply with respect to price of soymeal | -0.03 | Expert opinion |
| $$ε\_{DG}^{p}$$ | Elasticity of hog supply with respect to price of DG | -0.002 | Expert opinion |
| $$ε\_{co}^{k}$$ | Elasticity of poultry supply with respect to price of corn | -0.02 | Heien, 1976 |
| $$ε\_{sym}^{k}$$ | Elasticity of poultry supply with respect to price of soymeal | -0.03 | Meyers et al. 1992 |
| $$ε\_{DG}^{k}$$ | Elasticity of poultry supply with respect to price of DG | -0.001 | Expert opinion |
| $$ε\_{co}$$ | Own price elasticity of corn supply  | 0.25 | Bhattacharya et al., 2009 |
| $$ε\_{sym}$$ | Own price elasticity of soymeal supply  | 0.14 | Piggott et al., 2001 |
| $$ε\_{sy}$$ | Own price elasticity of soybean supply  | 0.25 | Gerlt, S., 2013 |
| $$ε\_{DG}$$ | Own price elasticity of DG supply  | 0 | Fixed proportion relation[[3]](#footnote-3) |
| $$ε\_{e}$$ | Own price elasticity of ethanol supply  | 0.65  | Elobeid and Tokgoz, 2008 |
| $$ε\_{e,co}$$ | Elasticity of ethanol supply with respect to price of corn | 0.13 | Luchansky and Monks, 2009 |
| $$ε\_{b}^{g}$$ | Elasticity of feeder cattle supply with respect to pasture yield | 0.25 | Expert opinion |
| $$ε\_{co}^{k}$$ | Corn supply elasticity with respect to rainfall | 0.16 | Authors‘ estimation using Westcott and Jewison 2013  |
| $$ε\_{co}^{k}$$ | Soybean supply elasticity with respect to rainfall | 0.23 | Authors’ estimation using Westcott and Jewison 2013  |
| $$τ\_{b}^{rw}$$ | Elasticity of beef quantity at the retail level with respect to quantity at the processing level | 0.71 | RTI, 2007 |
| $$τ\_{b}^{wr}$$ | Elasticity of beef quantity at the processing level with respect to quantity at the retail level | 1.03  | Brester et al., 2004 |
| $$τ\_{b}^{ws}$$ | Elasticity of beef quantity at the processing level with respect to quantity at the feedlot level | 0.93 | RTI, 2007 |
| $$τ\_{b}^{sw}$$ | Elasticity of slaughter beef quantity at the feedlot level with respect to beef quantity at the processing level | 1.02  | Brester et al., 2004 |
| $$τ\_{b}^{sf}$$ | Elasticity of slaughter quantity at the feedlot level with respect to feeder cattle quantity at the farm level | 0.94 | RTI, 2007 |
| $$τ\_{b}^{fs}$$ | Elasticity of feeder quantity at the farm level with respect to slaughter quantity at the feedlot level | 0.78  | Brester et al., 2004 |
| $$τ\_{p}^{rw}$$ | Elasticity of pork quantity at the retail level with respect to quantity at the processing level | 0.95 | Expert opinion |
| $$τ\_{p}^{wr}$$ | Elasticity of pork quantity at the processing level with respect to quantity at the retail level | 1.01 | Brester et al., 2004 |
| $$τ\_{p}^{wf}$$ | Elasticity of pork quantity at the processing level with respect to hog quantity at the farm level | 0.95 | Expert opinion |
| $$τ\_{p}^{fw}$$ | Elasticity of hog quantity at the farm level with respect to quantity at the processing level | 1.00 | Brester et al., 2004 |
| $$τ\_{k}^{rw}$$ | Elasticity of poultry quantity at the retail level with respect to quantity at the processing level | 0.95 | Expert opinion |
| $$τ\_{k}^{wr}$$ | Elasticity of poultry quantity at the processing level with respect to quantity at the retail level | 0.98 | Brester et al., 2004 |
| $$τ^{co, s}$$ | Elasticity of corn demand by beef sector with respect to quantity of slaughter cattle  | 1 | Unit cost function (UCF)[[4]](#footnote-4) |
| $$τ^{co,p}$$ | Elasticity of corn demand by pork sector with respect quantity of hog  | 1 | UCF |
| $$τ^{co,k}$$ | Elasticity of corn demand by poultry sector with respect to quantity of poultry  | 1 | UCF |
| $$τ^{co,e}$$ | Elasticity of corn demand by ethanol sector with respect to quantity of ethanol  | 1 | UCF |
| $$S\_{b}^{co}$$ | Share of total corn utilization by beef sector  | 0.11 | Conley et al., 2012 |
| $$S\_{p}^{co}$$ | Share of total corn utilization by hog sector  | 0.11 | Conley et al., 2012 |
| $$S\_{k}^{co}$$ | Share of total corn utilization by poultry sector  | 0.13 | Conley et al., 2012 |
| $$S\_{e}^{co}$$ | Share of total corn utilization by ethanol sector  | 0.35 | Conley et al., 2012 |
| $$S\_{x}^{co}$$ | Share of total corn utilization for net corn export | 0.15 | Conley et al., 2012 |
| $$τ^{sym, s}$$ | Elasticity of soymeal demand by beef sector with respect to quantity of slaughter cattle  | 1 | UCF |
| $$τ^{sym,p}$$ | Elasticity of soymeal demand by pork sector with respect quantity of hog  | 1 | UCF |
| $$τ^{sym,k}$$ | Elasticity of soymeal demand by poultry sector with respect to quantity of poultry  | 1 | UCF |
| $$S\_{b}^{sym}$$ | Share of total soymeal utilization by beef | 0.09 | USB, 2012 |
| $$S\_{p}^{sym}$$ | Share of total soymeal utilization by hog sector  | 0.19 | USB, 2012 |
| $$S\_{k}^{sym}$$ | Share of total soymeal utilization by poultry sector  | 0.35 | USB, 2012 |
| $$S\_{x}^{sym}$$ | Share of total soymeal utilization for net soymeal export | 0.23 | USB, 2012 |
| $$τ^{DG, s}$$ | Elasticity of DG demand by beef sector with respect to quantity of slaughter cattle  | 1 | UCF |
| $$τ^{DG,p}$$ | Elasticity of DG demand by pork sector with respect quantity of hog  | 1 | UCF |
| $$τ^{DG,k}$$ | Elasticity of DG demand by poultry sector with respect to quantity of poultry  | 1 | UCF |
| $$S\_{b}^{DG}$$ | Share of total DG utilization by beef sector | 0.56 | Hoffman and Baker, 2011 |
| $$S\_{p}^{DG}$$ | Share of total DG utilization by hog sector  | 0.10 | Hoffman and Baker, 2011 |
| $$S\_{k}^{DG}$$ | Share of total DG utilization by poultry sector  | 0.07 | Hoffman and Baker, 2011 |

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1. Based on the structural models, the estimates were obtained by following double log differential forms with appropriate corrections for serial correlation. [↑](#footnote-ref-1)
2. Because of the fixed proportion relation between corn and ethanol, the decision on volume of ethanol production determines the quantity of corn demanded. This implies that corn demand for ethanol does not respond to corn price and is inelastic as shown in Fig 1, panel f. [↑](#footnote-ref-2)
3. Result of the fixed proportion relation between ethanol and its by-product DG [↑](#footnote-ref-3)
4. Total differentiation of a demand function derived by assuming a unit cost function and using shepherd’s lemma results into expression similar to equation 19 with elasticity of demand with respect to downstream quantity equal to 1. [↑](#footnote-ref-4)