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Abstract

Over the years, there have been a number of issues pertaining to the import of beef into U.S economy. The price of beef has recorded steady increase in recent years. Internal factors such as input for raising cattle and external factors like import quota, tariffs and prices of related animal products may have accounted for the high prices of beef. Country of Origin Labeling (COOL) is a labeling U.S. Farm Bill law passed in 2008 by the United States Congress demanding meat, fruits, vegetables and peanuts to be labeled as to their country of origin. The implementation of country of origin labeling has become one of the controversial issues in the US beef industry and even Canada. The main objective of the study is to determine whether the impact of COOL is serving as an import quota on U.S. beef imports. This is achieved by employing a partial equilibrium analysis to model U.S. import demand for U.S. beef imports. This paper develops an Import Demand model for the U.S. Beef Sector to evaluate if COOL serves as an import quota for U.S. beef imports. The randomized effect model and the OLS regression were estimated. Unrestricted model to test the homogeneity and symmetry conditions: b) Restricted model with homogeneity and symmetry imposed along with a dummy variable COOL taking the value as “1” for pre-COOL, otherwise, “0. The analysis employed a partial equilibrium model to model the import demand function of beef imports. Controlling for other variables that affect the volume of imports, the estimated coefficients of MCOOL was consistently negative in all the Models. This negative effect implied that following the execution of mandatory labeling, there has been a significant increase in the imports of beef into the U.S. from the exporting countries under both the restricted models.

Keywords: Beef, Mandatory, Country of Origin Labeling, Import Demand Model, & Regression Models.
Introduction

Country of Origin Labeling (COOL) is a labeling Farm bill law passed in 2008 by the United States Congress demanding meat, fruits, vegetables and peanuts to be labeled as to their country of origin. The latest U.S. labeling rules, put into effect in 2013, require meat sold in grocery stores to indicate the country, or countries, where the animal was born, raised and slaughtered. The COOL law dictates only products derived from cattle born, raised, and processed beef in the United States can be labeled as U.S. origin (USDA 2009). The cost of production for covered commodities through increased labeling, separating and tracking cost has increased as a result of COOL. The whole supply chain, including imported commodities has exaggerated production and increases in cost are likely to lead to decreases in the production of covered commodities, both domestic and imported. USDA’s Food Safety and Inspection Service (FSIS), is accountable for tagging meat products. The labeling policy (FSIS) allows fresh muscle cuts of beef and lamb to be recognized as U.S. beef or U.S. lamb, as far as the statement is straight. The Agricultural Marketing Services (AMS) OF USDA suggestion a volunteer program to formally certify that livestock, meat, and meat products invented from the U.S. are qualified to be labeled as U.S. beef. The volunteer program certifies that livestock and meat products are been produced from livestock born, raised, slaughtered, and treated in the U.S. Advocates of MCOOL have spoken worries about the safety of imported food and have argued that consumers have a right to know where their food is coming from (Food Marketing Institute, 2002). These same promoters of Country of Origin Labeling (COOL) contended that consumers would choose domestically raised animals over imported animal from other countries. In the Midst of beef industry members at all levels, opinions over MCOOL barely declined and perhaps strengthened after the Farm Bill was passed. The objective as with numerous other research on COOL is to econometrically
estimate the elasticity’s to determine the beef imports into U.S by analyzing the import demand model.

**Literature Review**

Since the introduction of country of origin labeling there have been arguments for and against the Policy. This chapter grants the literature on the necessary problems associated to the execution of mandatory Country of Origin Labeling. This section starts by deliberating on the ruling that finally took effect on March 16, 2009, involving information regarding country of origin to be labeled on a number of fresh food including vegetables, fruits and meat. Additionally it gives a background to the mandatory COOL policy, import quota of beef, and the quantity of beef imported since the introduction of mandatory COOL, and the trading effect of mandatory COOL. This chapter also explains mandatory COOL as a trade effect to the beef industry. It emphasis more on the Ex Post Analysis of the effects of Country of Origin Labeling on Trade Flows. This is monitored by an argument of the methodology employed to develop an Import Demand model for the U.S. Beef Sector to evaluate if COOL serves as an import quota for U.S. beef imports. Literature on studies that employed, Almost Ideal Demand System (AIDS) are estimated using one-way fixed effect seemingly unrelated regression models. This chapter settles with a summary of the literature reviewed. The analysis of related literature stops from the question of who will pay the cost associated with the implementation of MCOOL and how much are they willing to spend on the affected meat products? Some advocates of MCOOL deduced the results of their willingness to pay (WTP) studies to be signal that prizes would exist at the supermarket for U.S. meat products. Before getting that conclusion, a quantity of other factors must be considered. All of the WTP studies exploited common depending valuation or experimental auction methods, which shown to be very beneficial in influential values for both
nonmarket and market goods. However, as with any depending valuation or experimental research, the results obtained from these studies are estimates of potential values and are dependent upon both the methods used (research design) and the sample of the population studied. The potential for differences in WTP estimates due to elicitation method used is evident by the wide distribution of premiums across studies. The size of premiums for “Certified U.S.” or “Guaranteed U.S.” meat products decrease as a larger sample of the population is surveyed. The premiums elicited from the more expansive Chicago and Denver sample (Umberger et al., 2003) and the continental U.S. sample are much lower than the premiums obtained from the regional Colorado study (Maria L Loureiro & Umberger, 2003). The United States Department of Agriculture. Agricultural Marketing Service (2002) published a "Notice of Request for Emergency Approval of a New Information Collection." In this notice, AMS reported its estimate for the record-keeping costs associated with MCOOL. This estimate for all industries covered by MCOOL was $1.968 billion. United States Department of Agriculture. Agricultural Marketing Service (2003) estimated these costs would be distributed as follows: $1 billion for producers, $340 million for food handlers and $627.75 million for retailers. Annual cost estimates for the beef industry range from $200 million to $6.4 billion, and from $20 million to $1 billion for the pork industry (D. P. Anderson, Davis, & Evans, 2003; Hayes & Meyer, 2003; Sparks Companies, 2003). Proponents of MCOOL argued that most of the larger cost estimates are overstated (Van Sickle et al., 2003). They also point to results of experimental auctions and surveys which suggested that some consumers may be willing to pay a premium for beef that has been labeled by country of origin (Maria L Loureiro & Umberger, 2003). Moreover, the United States Department of Agriculture. Agricultural Marketing Service (2003) found “little evidence that consumers are willing to pay a price premium for country of origin labeling” and that
“estimated benefits associated with this rule are likely to be negligible” (p. 49). A number of livestock and food industry groups continue to oppose MCOOL as costly and unnecessary. These groups and the main livestock exporters to the United States; Canada and Mexico view the requirement as trade-distorting. Twine and Rude (2012) estimated that MCOOL was more harmful to Canadian cattle producers than appreciation of the Canadian dollar and the recent global economic recession. Additional research suggested that MCOOL has reduced the competitiveness of Canada’s hog and pork industry (Rude, Gervais, & Felt, 2010). According to United State Department of Agriculture. Food Safety Inspection Service (2000), opponents of the law have argued that the costs incurred by producers, importers, packers, wholesalers, and retailers to segregate and preserve the identity of meat products as well as the government expenditures that would be necessary to ensure compliance would outweigh the benefits of labeling. As in any market situation, the general impact of increased marketing costs will be borne in part by consumers as higher retail prices and in part by producers as increased production costs. Although country-of-origin labeling would give U.S. producers the opportunity to create a competitive niche market, as long as consumers select U.S. beef over imported beef. As noted by Zago and Pick (2004), welfare effects of labeling regulation ultimately depend upon the perception of quality differences between imported and domestic products and the size of regulatory costs. Apart from the MCOOL debate, Caswell and Padberg (1992) contended in their analysis of the role of labeling information in consumer-good markets that food labels provide more than just “point-of-purchase” information. In today’s food markets, information provided through required labeling disclosures “may change the attitude of consumers or consumers advocate (even if the consumers do not read or understand it) and may change the sellers” strategy” (Caswell & Padberg, 1992). For U.S. farmers to benefit financially from mandatory
labels, consumers would have to prefer domestic products to imports. If consumers do prefer domestic products, labels would allow consumers to discriminate between imports and domestic products. As a result, demand for domestic meat products in the U.S. would rise along with domestic meat prices. Further, domestic products would increase their market share at the expense of imports. However, if consumers do not generally prefer domestic products, labeling will not confer any financial benefits to domestic producers. Critics of MCOOL argued that large compliance costs will be more than offset any consumer benefits. The USDA/AMS (2002), the agency responsible for writing the final MCOOL rules, has stated self-certification is not sufficient, and a credible MCOOL program will require verifiable records and a system allowing products to be traced back to the animal of origin. Others have argued that a domestic traced back system is not required to implement MCOOL, and that the least costly method for regulating MCOOL is presumption of U.S. origin unless the food product carries a label indicating it is a product of another country (Smith, 2003; Van Sickle et al., 2003). USDA’s analysis of its final rule estimated first-year implementation costs to be approximately $2.6 billion for those affected. Of the total, each commodity producer would bear an average estimated cost of $370, intermediary firms (such as wholesalers or processors) $48,219 each, and retailers $254,685 each. Some analysts argued that origin does not matter to U.S. consumers (Blank, 1998). A fast-food hamburger could be made from lettuce and tomato from Mexico, a bun fabricated from Canadian wheat, and a meat patty composed of lean meat from Australia and fat trimmings from the U.S. Current fast-food restaurant advertising does not mention origin. It emphasizes price, portion size, flavor, etc., not country-of-origin. Since the publication of the (United States Department of Agriculture. Agricultural Marketing Service, 2003) cost estimate, others have developed their own estimates of the costs (both direct and indirect) associated with
MCOOL. Hayes and Meyer (2003) similarly concluded the costs of MCOOL implementation would be significant. Based on their estimates, a system with full traceability would raise farm-level production costs for pork by $10.22/head (or by a total of just over $1 billion). Hayes and Meyer (2003) also explored the potential impacts of MCOOL resulting from a segregated system. Assuming an own-price elasticity of pork of about -0.70, their projected $10/head increase in costs would result in a 7% decrease in retail pork demand. Van Sickle et al. (2003) were decidedly more optimistic in their evaluation of the impacts of MCOOL. Extrapolating from willingness-to-pay estimates, Umberger et al. (2003), calculated an "aggregate willingness to pay" in the beef industry alone of almost $3 billion Van Sickle et al. (2003) also noted other potential benefits such as increased consumer confidence in the labeled product. Plain and Grimes (2003), questioned the relevance of using willingness-to-pay estimates to project benefits from MCOOL. They noted respondents in the study conducted by Umberger et al. (2003) indicated a willingness to pay a premium for beef labeled as a U.S. product. They argued that since almost 90% of muscle cuts of beef and about 75% of ground beef are already of U.S. origin, consumers will not have to pay a premium for U.S. beef even though a fairly large percentage of them express a willingness to do so. According to the North American Meat Institute (2014), over the past 10 years, per capita expenditures for beef rose from $188.65 in 1998 to $287.65 in 2012. Pork expenditures also increased from $120.40 in 1998 to $160.06 in 2012. Consumers increased their spending on chicken products from more than $111 per capita in 1998 to $154.14 in 2012. Consumers spent an average of $3.03 per pound on hamburger in 2012 and $4.99 per pound for choice beef cuts. Choice beef cuts can include loins, rib eyes, chuck and flank steaks. In 2012, meat and poultry expenditures accounted for 1.6 percent of disposable income per capita, and for 14.3 percent of total food expenditures. In 1998
approximately 13 percent of the U.S. total beef supply was imported from 11 countries, primarily Argentina, Brazil, Canada, Mexico and New Zealand. While much of this imported beef is subsequently processed or mixed with U.S. beef to make ground products, in 1998, approximately 10.3 percent of the total U.S. beef supply. Peel (2003) estimated that COOL would result in decreasing Mexican fed beef imports by 56,248 metric tons (12.2 percent decrease from the current imports) annually, lowering U.S. calf prices by $1.13/cwt, and decreasing feeder and fed cattle prices by 56 cents/cwt. and 35 cents/cwt., respectively. Obara, Dyck and Stout (2003) in their study found that special safeguard provisions which aim to limit import surges by allowing United Stat to raise tariffs if the volume of imports exceeds a certain amount or if the import prices fall by a certain percentage of a base price for US beef import. According to Plain, (2003) U.S. cattle producers can benefit from COOL if the implementation costs are modest and if the process of labeling grocery store beef for country of origin results in a significant increase in the price of U.S. origin beef without a loss in market share. The price of U.S. beef needs to increase enough to offset the cost of COOL to producers, processors and retailers (assuming that processors and retailers will pass-back their COOL related costs in the form of lower bid prices).

However, from 1965 to 1972 beef imports were regulated to a large extent by voluntary quota arrangements between the United States and the major beef-exporting countries under the shadow of the 1964 Meat Import Bill. According to the United States Department of Agriculture Economic Research Service (2003), beef imports from all sources represented 16.9% of total U.S. beef supplies. Fifty-one percent of all beef imports were trimming and manufacturing grade beef which is subsequently ground into hamburger. Live cattle imports on a carcass weight basis from Canada represented approximately 28% of U.S. beef imports in 2002. The U.S. imported approximately 1.1 billion pounds of pork in 2002, which represented about 5.2% of total U.S.
pork supplies. Over 80% of these imports originated in Canada. In addition, the U.S. imported 5.7 million head of hogs and feeder pigs, representing about 5.7% of U.S. hog slaughter. Almost all hog imports originated in Canada (United States Department of Agriculture Economic Research Service, 2003). The Canadian cattle and hog industries stated MCOOL has cost them combined losses Fifty-one percent of all beef imports were trimming and manufacturing grade beef which is subsequently ground into hamburger. Live cattle imports on a carcass weight basis from Canada represented approximately 28% of U.S. beef imports in 2002. Consumers in U.S. prefer domestic beef to imported beef. Mutondo and Henneberry (2007) used the Rotterdam model to evaluate demand on source-differentiated beef. They found that U.S. grain-fed beef had a reasonable advantage in the domestic market over imported beef from Australia, Canada and New Zealand. As said by Rausser, (1974) the several changes in the quota level brought about considerable controversy over beef import quota policy and the current period of high meat prices through 1960’s. The recent increase in beef prices is as a result of import quota restrictions as contended by consumers, and beef producers also argued that unrestricted imports could cause irretrievable harm to the domestic livestock industry (U.S. Congress, 1969, p. 51). The 1964 legislation enacted enforced quota limitations on the annual (maximum) level of United States beef imports bill (PL 88.482). A base was formulated as the average level of imports over the period 1959-1963 the legislation provided for the import quota to raise proportionately with expansion of the domestic beef industry. According Allen (1983) the 1964 Meat Import legislation law allowed the United States to impose import quotas in any year if specific fresh, chilled, or frozen meat imports exceeded an established level. The legislation allowed the import quota to rise proportionally with the expansion of domestic beef production from a base linked to the average level of imports over the period 1959 to 1963. Import quota restrictions imposed by
the U.S. Meat Import Act of 1979 have been binding in that actual imports have been near the quota limit each year since the act was passed. In 1968, it became evident that the trigger level would be exceeded. The threat of import quotas resulted in VERs being adopted by beef exporters to the United States. Aside from the period 1972-74 when the president suspended import quotas because domestic beef prices were high and rising, this voluntary system has remained as the major tool to limit beef imports to the United States. U.S. imports have been also subject to a 6.6p per kilogram tariff. This studies uses data after the implementation of COOL to decipher what has been the actual impact of the program. Most of the studies that precede COOL implementation used simulation models to investigate the impact of the program; contrary to more recent studies using actual data after the program was implemented. Rude et al. (2010) while performing an ex-post analysis study, used end-of-sample tests of structural instability to assess the impact of COOL on Canadian exports of feeder and slaughter hogs to the U.S. Somwaru and Whitaker (2009) also used simulation data in a computable general equilibrium (CGE) model to study the aggregate effect of COOL in U.S. economy and the world at large. In another ex-post study, Wozniak (2010) used a non-linear AIDS model to study U.S. import demand beef imports in the aftermath of COOL implementation. This study revealed that U.S. consumers’ demand remained stable post-implementation of mandatory COOL. The study concluded that the implementation of mandatory COOL did not significantly change demand for U.S. beef imports.
Methodology

The most widely used of the demand function models are the AIDS model, the Rotterdam model and the Import Demand function which are broadly used by authors and researchers, since it offers flexible functional forms and comparatively easy to estimate. Given the objective to evaluate if Mandatory Country of Origin Labeling is representing as an import quota for U.S beef imports. The research estimates a partial equilibrium to model import demand. This section present the empirical data used to determine beef imports, the theoretical framework sustaining this study, experimental framework and the methods used in addressing every objective. The models discussed are the partial equilibrium model and the import demand model. This section also reports the sources and data form used in our assessment. The import demand model has originated with several demand functions for estimation.

Modeling Import Demand Model

Econometric valuations of an import demand model comprise that the demand for imports is the function of domestic prices and real incomes (Murray and Ginman 1975, Mayes 1981, Deak and Sawyer 1988 and Camoe 1996). This paper advocates the partial equilibrium model in modeling the import demand function. The model that was used in the study is specified as follows:

Algebraically, import demand is defined as;

\[ Q_m(P,Y) = Q_d(P, Y(P)) - Q_s(P) = Q_m(P, Y) \] (1)

Where \( Q_m \) is the quantity of the commodity imported as a function of domestic price \( P \) and income \( Y \), \( Q_d \) is the domestic quantity demanded as a function of price \( P \), and income \( Y \), and \( Q_s(P) \) is the quantity of the good supplied domestically at each price level.
Export Supply Function

The export supply function is derived as the horizontal difference between the domestic quantity supplied and domestic quantity demanded of a commodity at any given price. Export supply is positive when the domestic quantity supplied exceeds domestic quantity demanded, and this occurs at price levels at which the domestic price is higher than the international price, thus creating a surplus (excess supply) on the domestic market. The export supply (or excess supply) is zero at the point where the domestic and international prices of the commodity are equalized. Export supply may be derived as;

\[ Qx (P) = Qs (P) - Qd (P) \]  

(2)

Where \( Qx (P) \) is the quantity of exports of the commodity as a function of price, \( Qs \) and \( Qd \) are domestic quantity supplied and domestic quantity demanded, respectively.

Empirical Models

The import demand model was specified as:

\[ Mt^* = \alpha_0 + \alpha_1 Yt + \alpha_2 Pt + \epsilon_t \]  

(3)

Where \( Mt^* \) is the desired quantity of imports, \( Yt \) is the gross domestic product (or income), \( Pt \) is the relative price defined as the ratio of import price (Pmt) to domestic price (Pdt).

A partial adjustment mechanism may be introduced into the model (Doroodian et al 1994) and this is expressed as;

\[ \Delta M_t = M_t - M_{t-1} = \delta (M_{t}^* - M_{t-1}) \]  

(4)

Where \( M_t \) and \( M_{t-1} \) are actual quantities imported at time \( t \) and \( t-1 \) respectively, and is the coefficient of adjustment, such that; \( 0 \leq \delta \leq 1 \).and rearranging the terms yields the following dynamic import demand equation;

\[ M_t = \delta \alpha_0 + \delta \alpha_1 Y_t + \delta \alpha_2 P_t + (1 - \delta) M_{t-1} + \delta \epsilon_t \]  

(5)
Data & Estimation Procedure

The dependent variable is the quantities of annual beef imports of U.S. The data for this variable were obtained from the USDA Foreign Agricultural Service (GATS database). The annual U.S beef imports data runs from January 1990 to December 2015. The data consists of Quantities, Unit price, Exchange Rate, GDP (Income) and Population. We considered a sample of eight countries, Gross domestic products (GDP) of U.S. is expected to have a positive impact. Data on GDP of the countries are obtained from the database of World Bank. Countries include Australia, Canada, Mexico, Uruguay, New Zealand, Argentina and other countries were added together as other sources. Data on exchange rates of countries are acquired from the World Bank.

Data in this study were evaluated with both pooled and random effect regression. The generalized least square regression technique was used to determine the variables that influence total quantities of beef from importing countries.
Results & Discussion

The coefficient of import price of beef is statistically significant and with the expected sign. The coefficient of -1.7392 implies a 1% increase in the import price reduces U.S. beef imports by 1.74% which is very elastic. Real exchange rate constructed as U.S. dollar to exporting country’s currency is also significant and with expects signs. The elasticity of -0.3045 implies a 1% appreciation of the U.S. dollar increases beef imports by only 0.30%. Also, as expected the GDP of U.S. and that of the countries are significant and positive. For the importing country, a rise in the GDP means more consumption while it indicates the capacity for the exporting country to produce and export. The exporter’s population is also significant. The elasticity of -0.8846 implies that a 1% increase in population reduces beef exports by 0.88%.

The result of the import price and exchange rate in the Random Effect model is not different from the Pooled as presented in table 2. They are both significant and with expected signs. However, as concerns both GDPs, it’s only the exporter’s that is significant. The elasticity of 0.1902 implies that beef export goes up by about 0.19% with a percent rise in the GDP. The Mandatory COOL dummy was not significant in either model.

In terms of performance, pooled regression did better than the random effect model as fewer variables were significant in the latter.
Summary & Conclusion

The Mandatory COOL policy together with traditional import demand variables were applied to both pooled and panel data model to examine whether the policy could be seen as import reducing such as a binding quota or a tariff. The coefficient of the policy was not significant in both models. This result is consistent with several studies that have looked at the impact of MCOOL on U.S. beef consumption concluded that the policy. Beef consumption in U.S. has not decline due to the policy. Instead, the driving force of U.S. import is import price, the strength of the dollar, and national income. The exporter’s population is also a factor. As the population of the exporting grows beef exports are reduce.
References


Appendix

Table 1

The results of the Pooled Regression Analysis

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Coefficients</th>
<th>Standard Error</th>
<th>t-stat</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>371.5117</td>
<td>233.6399</td>
<td>1.59</td>
<td>0.1134</td>
</tr>
<tr>
<td>log Unit Price</td>
<td>-1.7392</td>
<td>0.2708</td>
<td>-6.42</td>
<td>0.0000</td>
</tr>
<tr>
<td>log Exchange Rate</td>
<td>-0.3045</td>
<td>0.0866</td>
<td>-3.52</td>
<td>0.0005</td>
</tr>
<tr>
<td>log U.S gdp$/Billion</td>
<td>5.5522</td>
<td>2.8665</td>
<td>1.94</td>
<td>0.0542</td>
</tr>
<tr>
<td>log Exporter gdp</td>
<td>0.7870</td>
<td>0.2568</td>
<td>3.06</td>
<td>0.0025</td>
</tr>
<tr>
<td>cool dummy</td>
<td>-0.3584</td>
<td>0.3355</td>
<td>-1.07</td>
<td>0.2867</td>
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<tr>
<td>log importer Population</td>
<td>-20.9657</td>
<td>13.3989</td>
<td>-1.56</td>
<td>0.1192</td>
</tr>
<tr>
<td>log Exporter Population</td>
<td>-0.8846</td>
<td>0.1749</td>
<td>-5.06</td>
<td>0.0000</td>
</tr>
<tr>
<td>Border Dummy</td>
<td>-0.0411</td>
<td>0.2822</td>
<td>-0.15</td>
<td>0.8843</td>
</tr>
<tr>
<td>R Square</td>
<td>0.61</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted R Square</td>
<td>0.59</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 2

The results of the Random Effect Model

| Parameters      | Coefficient | Standard Error | Z    | p>|z| |
|-----------------|-------------|----------------|------|----------|
| log_price       | -1.7683     | 0.3033         | -5.8300 | 0.0000 |
| log_Exchge_Rate | -0.2513     | 0.0753         | -3.3400 | 0.0010 |
| log_U.S_gdp     | 5.1043      | 3.5716         | 1.4300 | 0.1530   |
| log_Exporter_gdp| 0.9991      | 0.1902         | 5.2500 | 0.0000   |
| log_importer_pop| -14.345     | 13.4009        | -1.0700 | 0.2840 |
| log_exporter_pop| -0.0217     | 0.0908         | -0.3100 | 0.7540 |
| cool_dummy      | -0.1105     | 0.3522         | -0.3100 | 0.7540 |
| border_dummy    | -0.2482     | 0.2162         | -1.1500 | 0.2510 |
| Cons            | 38.6521     | 38.6776        | 1.0000 | 0.3180 |
| R_Square        | 0.65        |                |       |          |
| Wald chi2(8)    | 375.7700    |                |       |          |
| Prob> chi2      | 0           |                |       |          |