

An Economic Analysis of the Southeast U.S. Shrimp Processing Industry Responses to an Increasing Import Base

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ABSTRACT

Farm-raised production of shrimp has increased significantly since the early-to-mid 1980s, with much of the increased output sold in the U.S. market. Concomitant with this increase, the output mix being exported to the United States has also significantly changed. The changing export composition and the absolute growth in exports to the U.S. market have resulted in major economic changes in the Southeast U.S. shrimp processing industry. This paper provides an economic analysis of the role played by increasing U.S. shrimp imports (particularly farm-raised shrimp) and changing product composition on Southeast U.S. processing activities.

KEY WORDS: Shrimp processing, shrimp imports, marketing margins

Un Análisis Económico de la Reacción de la Industria Camaronera del Sudeste de los Estados Unidos a la Creciente Base de Importaciones

Es conocido que las importaciones de camarón de Estados Unidos son cuantiosas y continúan ascendiendo. Los efectos de esta base de importaciones crecientes en sector pesquero de camarón son relativamente claros; específicamente, un descenso en el precio de camarón fresco en puerto. No obstante, ¿Cuales son los efectos de la base creciente de importaciones en el sector de procesamiento de camarón del sudeste de los Estados Unidos? Por un lado, el aumento de las importaciones provee una fuente de oferta de materia prima que, por las limitantes de la producción doméstica, es un pre-requisito para las

crecientes actividades de procesamiento. Por otra parte, el aumento de las importaciones, particularmente de importaciones con valor agregado (principalmente de producto pelado) compite directamente con el producto producido por el sector de procesamiento del sudeste de los Estados Unidos. El propósito de este artículo es proveer un análisis exploratorio del impacto del aumento de importaciones, particularmente de importaciones con valor agregado, en el sector de procesamiento del sudeste de los Estados Unidos. Para tal efecto, los autores han utilizado la base de datos de procesamiento anual del Servicio Nacional de Pescas Marinas (NMFS por su nombre en inglés) para el período desde el año 1975 hasta el año 2001. Esta base de datos, en conjunto con datos sobre importaciones y volumen de captura, es utilizada para explicar cambios observados en el sector procesador durante el período analizado. En general, un margen de mercadeo en descenso es propuesto como el principal argumento para una eventual consolidación en la industria procesadora nacional y, en menor grado, en la composición del producto. Las importaciones crecientes, las cuales originalmente beneficiaron a algunos segmentos de la industria procesadora con el aumento en la oferta de materia prima, ahora parecen estar impactando negativamente a todos los segmentos de la industria procesadora. Se podría argumentar que este efecto negativo refleja principalmente el aumento de la base de importaciones con valor agregado, las cuales han, desde inicio de los noventas, avanzado significativamente en proporción a las importaciones totales.

PALABRAS CLAVES: Industria camaronesa, análisis económico, importaciones

INTRODUCTION

U.S. imports of shrimp are known to be large and growing. In 1980, shrimp imports, expressed on a headless shell-on equivalent basis, totaled 258 million pounds and accounted for 55 % of total U.S. shrimp supply (i.e., U.S. commercial landings plus imports). By 2001, imports had advanced to 1.18 billion pounds at which point they represented 85 % of total U.S. supply. The vast majority of growth in U.S. shrimp imports represents farmed product. In conjunction with the increasing import base, the composition of imports has also been changing. In 1980, for example, headless shell-on product represented 63 % of total imports (by product weight) while peeled product (raw and other) accounted for 36 % (the small remaining amount constituted breaded and canned products). By 2001, the share of total imports accounted for by peeled product had advanced to almost 50 % while the headless shell-on share had fallen to 50 %.

The overall goal of this paper is to examine the role of increasing imports and concomitant change in import composition on the Southeast U.S. (i.e., North Carolina through Texas) shrimp processing industry. To achieve this goal, the world shrimp supply, including an analysis of farmed and wild production, is first reviewed for the 1980 - 2001 period. Then, the world export/import situation is briefly examined along with a more detailed analysis in fresh and frozen trade, there has been a sizeable increase in trade in

of the U.S. shrimp import market. The review of world shrimp supply and trade in the product 'sets the stage' for analysis of the U.S. Southeast shrimp processing industry. Specifically, using secondary data we explore how the increased imports and changing import composition have impacted processing activities including the number of firms, the marketing margin (and presumably profitability) and the composition of products produced by the Southeast U.S. shrimp processing sector. Finally, based on this analysis, we provide a brief forecast of changes that can be anticipated over the next several years in the Southeast U.S. shrimp processing industry.

WORLD SHRIMP SUPPLY

Shrimp production, as with many other seafood commodities, is a combination of wild harvest and farming activities. Estimated total annual warm-water shrimp production (i.e., captured and farmed product) throughout the world, as indicated in Figure 1.a, expanded from 3.4 billion pounds (live weight) in 1980 to about 7.8 billion pounds (live weight) in 2001. Overall, the increase in world shrimp production during the 1980 through 2001 period translates into a growth rate of about 220 million pounds per year. To place this annual growth rate in perspective, Southeast U.S. shrimp harvests generally fall in the 220 million pound to 280 million pound (live weight) range. Hence, annual growth in world production of warm-water shrimp can, in some years, approximate total U.S. production of warm-water shrimp.

Much of the growth in world warm-water shrimp production since 1980 has been the result of successful farming activities throughout the world, particularly in Asia and, to a lesser extent, in South and Central America. World production of warm-water farmed shrimp in 1980 equaled about 160 million pounds (live weight), which accounted for approximately five percent of total world production at the time. By 2001, farmed production had advanced to 2.8 billion live-weight pounds, or more than 35 % of total world warm-water shrimp output. Overall, warm-water farmed shrimp production increased by approximately 130 million pounds per year during the 1980 - 2001 period. Wild warm-water shrimp output equaled about 3.2 billion pounds in 1980 (Figure 1.a). Though there has been growth in this sector since 1980, it has been substantially less than the growth in farmed production. Specifically, at an annual growth rate of about 85 million pounds per year, production of wild warm-water shrimp advanced to almost 5.0 billion pounds in 2001.

WORLD EXPORTS AND IMPORTS

World exports of fresh and frozen shrimp (the two categories constituting the overwhelming majority of trade) equaled about 850 million pounds (product weight) in 1980 (Figure 1.b). By 2001, exports had almost quadrupled to 3 billion pounds. A minimum of 60 % of the total world shrimp production currently enters the trade market. The value of world exports in 1980 equaled \$2.3 billion, or about 15 % of the total world trade in seafood products. By 2001, the current value of the world shrimp trade in fresh and frozen product had increased to about \$8.4 billion (In addition to the increase

'prepared or preserved' shrimp which equaled about \$2.0 billion in 2001). Much of the apparent increase in current value is, of course, due to currency inflation. After adjusting for inflation, the value of the world shrimp trade advanced by about 70 % (from \$4.97 billion to \$8.42 billion based on the 2001 U.S. Consumer Price Index). This 70 % increase is considerably less than the 240 % increase in export quantity, suggesting a sharp decline in the real (i.e., deflated) price of the exported product. Overall, the \$2.87 constant-dollar per pound price of the exported product in 2001 reflects a 50 % decline from the \$5.82 per pound price in 1980 and about a 40 % price decline from the prices observed as recently as the 1986 - 1988 period (Figure 1.b). Given the relatively high increase in world income during the 1990s, the decline in price would tend to suggest that growth in shrimp supply has exceeded the growth in demand, resulting in a downward pressure on the real price.

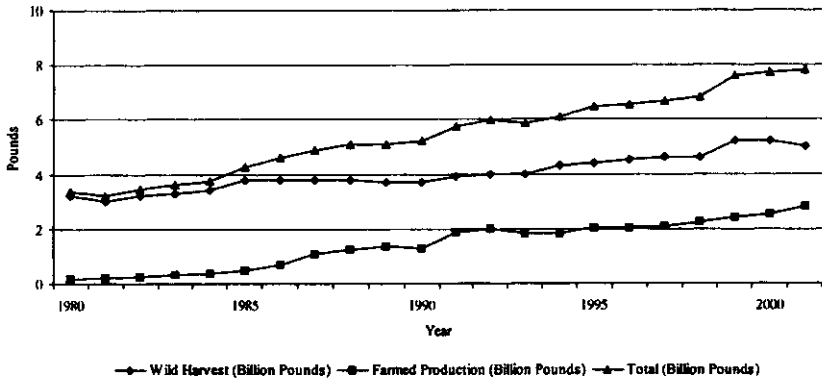
The increased farmed shrimp production, of course, allowed for more product to enter the international trade market. However, it is important to recognize that the rising trade flow reflects not just increased production in total, but also the source (i.e., farmed production versus wild production) of the increased output. As noted by Csavas (1994), the farm-raised shrimp is of greater importance than wild product in world trade. Reasons cited by the author include:

- i) The farm-raised product has greater 'freshness' than the wild product;
- ii) Farmed product is less seasonal in nature, and more reliable, than its wild counterpart;
- iii) Species and sizes can be controlled better in farm-based system than in a wild-based system; and
- iv) The current trend towards vertical integration in the farming system lends itself to better adaptation to consumer needs.

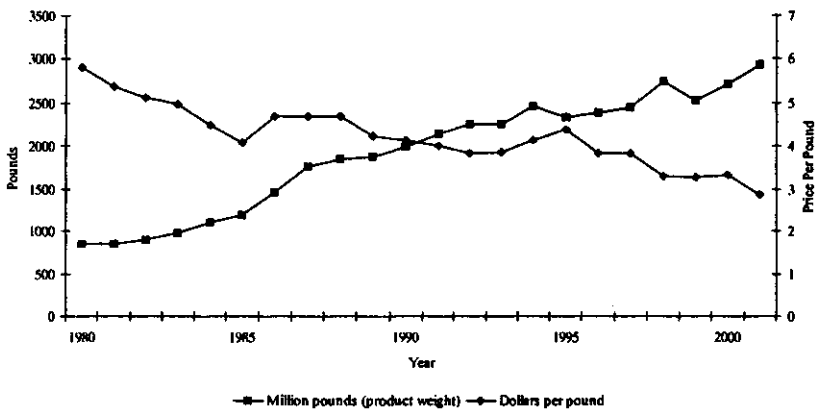
While the primary exporters of shrimp are many and have changed substantially over time, two countries, the United States and Japan, have long dominated the import market. These two countries, combined, account for upwards of 50 % of world shrimp imports by value. The European Union represents a significant portion of the remaining import market; particularly if limited to warm-water shrimp trade.

U.S. IMPORTS: A CLOSER LOOK

Annual U.S. shrimp imports, expressed on a headless shell-on equivalent weight basis, more than quadrupled over the 22-year period ending in 2001, from about 260 million pounds to almost 1.2 billion pounds (Figure 2.a). Given the relatively high proportion of the world export market which is destined for the United States, one would anticipate a close relationship between the world export price (Figure 1.b) and the U.S. import price (Figure 2.a). This relationship is borne out in a comparison of the two price trends (since the U.S. import price is expressed on a headless shell-on basis, one would expect that it would generally be somewhat lower than the world export price, which is given on a product weight basis). Like the world export price, the U.S. import price has been gradually trending down with the 2001 price exhibiting the lowest level dating back to 1980.

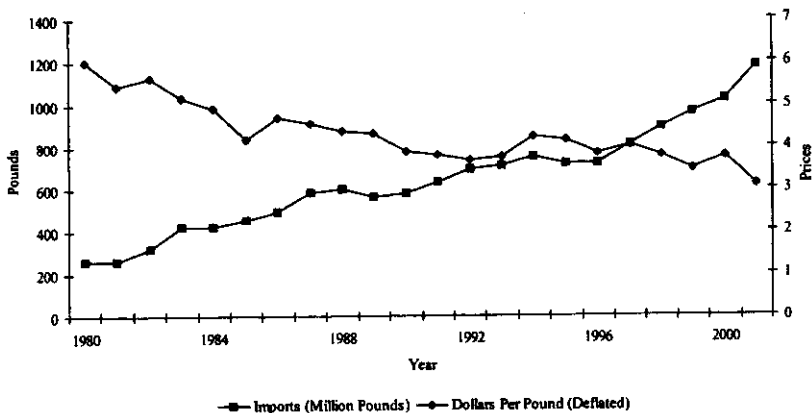


Panel A

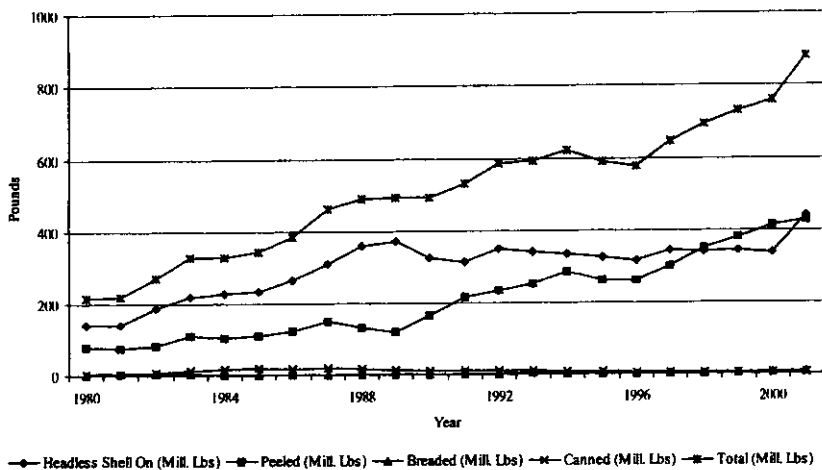


Panel B

Figure 1. Estimated world production of warm-water wild and farmed shrimp (live weight), 1980-2001 (Panel 1.a) and estimated world exports of fresh and frozen shrimp and deflated export price (2001 U.S. CPI), 1980-2001 (Panel1.b)



Panel A



Panel B

Figure 2. U.S. imports of shrimp expressed on a headless shell on weight (panel 2.a) and by product form (panel 2.b), 1980-2001

In addition to the increased import base, the composition of the imports has been changing. Specifically, value-added products, particularly peeled product, have been representing an increasing share of total imports. In 1980, for example, headless shell-on shrimp imports, equaling 139 million pounds (product weight), represented 63 % of total imports, expressed on a product weight basis (Figure 2.b). Peeled product (raw and other), equaling 76 million pounds and representing 35 %, accounted for almost all of the remaining imports. Canned and breaded products represented the remaining two percent of total imports. While imports of headless-shell on product increased throughout the period of analysis to 442 million pounds in 2001, its share fell to 50 % of the total import base. By comparison, the share of the total import base represented by peeled product increased to almost 50 %.

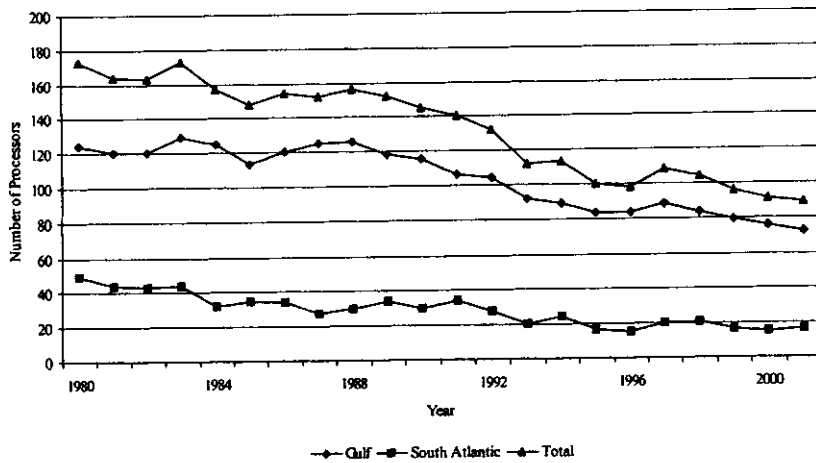
In general, while there has been a steady growth in peeled product during the 1980 - 2001 period, the growth since the early 1990s can best be defined as 'explosive.' Specifically, U.S. imports of peeled product advanced by 160 % since 1990, from 164 million pounds to 430 million pounds in 2001. The increase is being 'fueled' by developing countries attempting to garner additional hard currency via value-added activities. As discussed below, the changing import composition has significant ramifications with respect to the domestic processing sector.

U.S. SOUTHEAST SHRIMP PROCESSING

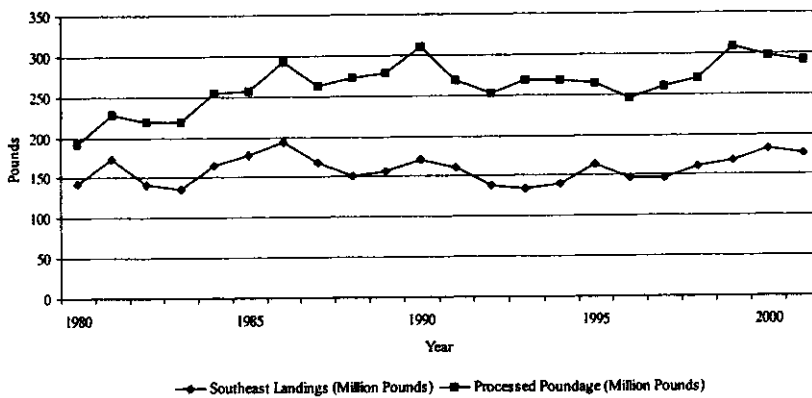
Shrimp represents the primary component of the Southeast seafood processing industry, generally contributing more than 80 % of the total edible production activities by value. The Southeast U.S. processing industry, using a combination of domestic raw material and imported raw material, generated sales of \$1.1 billion in 2001. A brief review of the processing sector, with emphasis being given to the impacts of imports, is presented below. Processing information used in the review is based on annual end-of-the-year surveys of processing establishments conducted and maintained by the National Marine Fisheries Service (NMFS). While processing information is available from 1973 forward, the analysis presented in this paper begins in 1980.

Firms and Production Activity

The number of firms engaged in Southeast shrimp processing activities declined almost by half, from 173 to 89, during the 1980—2001 period (Figure 3.a). As indicated, the decline was relatively steady with a reduction of more than fifty firms in the last decade (1991 through 2001). This compares with a reduction of only about twenty firms during the decade of the 1980s. While most agricultural commodities have observed consolidation in recent years, the consolidation in the Southeast shrimp processing sector is almost certainly tied, at least in part, to the increasing import base, including the increasing imports of value-added products (primarily peeled raw and cooked shrimp). Overall, the number of processors in the Gulf fell by about 40%, from 124 to 72, while the reported number of South Atlantic processors fell from 49 to 17, or by almost two-thirds (Figure 3.a).



Panel A



Panel B

Figure 3. Reported number of Southeast U.S. shrimp processors (panel A) and processed poundage and Southeast landings expressed on a headless shell-on weight basis (panel B), 1980-2001

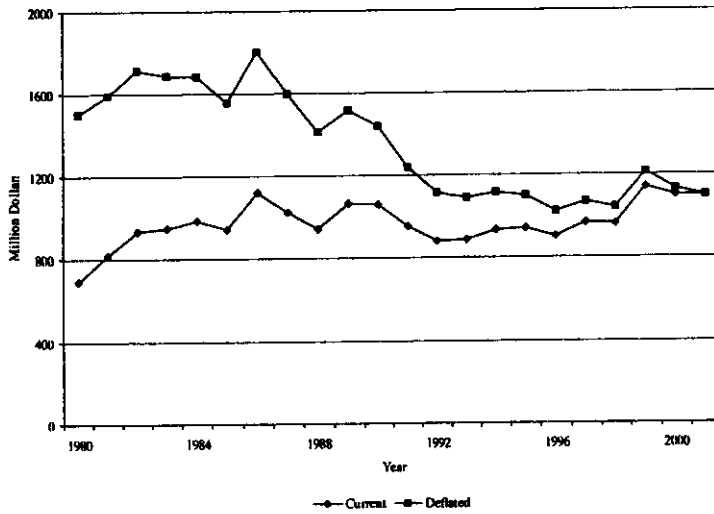
Despite the sharp reduction in number of reported Southeast shrimp processing establishments, the quantity processed, expressed on a headless shell-on equivalent weight basis, has remained relatively stable since the mid 1980s, fluctuating in the 250 million pound to 310 million pound range (Figure 3.b). This follows a period of rapid expansion in output during the early-to-mid 1980s. Overall, Gulf processors have historically accounted for an average of about 85 % of this total production.

The deficit in domestic landings relative to Southeast shrimp processing needs is well documented (see, for example, Prochaska and Andrew 1974, Roberts et al. 1992, and Keithly and Roberts 1995). Given the significant increase in imports since the early-to-mid 1980s, therefore, one might expect increased import usage by the Southeast shrimp processing sector. While NMFS does not ask processors to differentiate output derived from domestic shrimp from that of imported shrimp, some information can be gleaned by comparing total processing activities to domestic landings. Doing so will provide a true estimate of import usage if all domestic production is utilized by the processing sector. Based on analysis by Keithly and Roberts (1995), this assumption appears plausible.

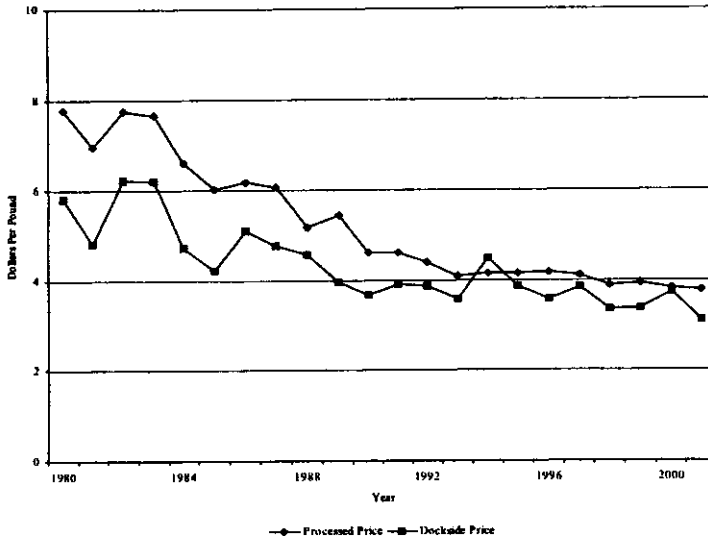
In 1980, imports accounted for an estimated 50 million pounds of total Southeast shrimp processing activities (Figure 3.b; i.e., the difference between processed poundage and Southeast U.S. landings). Import usage increased rapidly, thereafter, most likely in association with increased Ecuadorian cultured shrimp exports to the U.S. market. By 1986, estimated imports accounted for about 100 million pounds, or one-third, of the total domestic Southeast shrimp processing activities. During the 1992 - 1994 period, import usage as a proportion of total processing activities equaled almost 50 %; indicating that almost as much imported shrimp was used by the processing sector as domestic shrimp. This period can be characterized as one of very high import usage relative to total processing activities. Since this peak period, however, import usage has fallen, averaging slightly more than 110 million pounds annually since 1995 (approximately 40 % of the total).

To determine why Southeast shrimp processing activities have not increased in relation to imports, the value of Southeast shrimp processing activities will be examined first. As the information in Figure 4.a suggests, the current value of Southeast U.S. shrimp processing activities, while fluctuating widely on a year-to-year basis, has exhibited no long-term upward trend since the mid 1980s. When adjusted for inflation, the trend has been decidedly downward. Overall, the deflated value of processing activities during the 1999-2001 period averaged only 70 % of that observed during the 1983 - 1985 period. This 30 % decline, while significant in and of itself, came during a period of time in which pounds processed increased by more than 20%. This suggests that the deflated price of the processed product has fallen sharply during the 1980 - 2001 period.

Overall, the deflated price of the processed product fell from well over \$7.00 per pound (headless shell-on equivalent weight) during the early 1980s to less than \$4.00 per pound during the late 1990s and into the next decade (Figure 5.b). The decline has been, for the most part, steady with no sign of abatement.

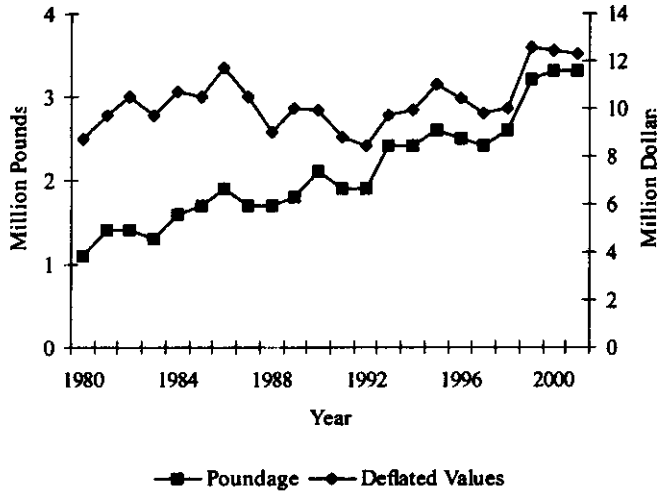


Panel A

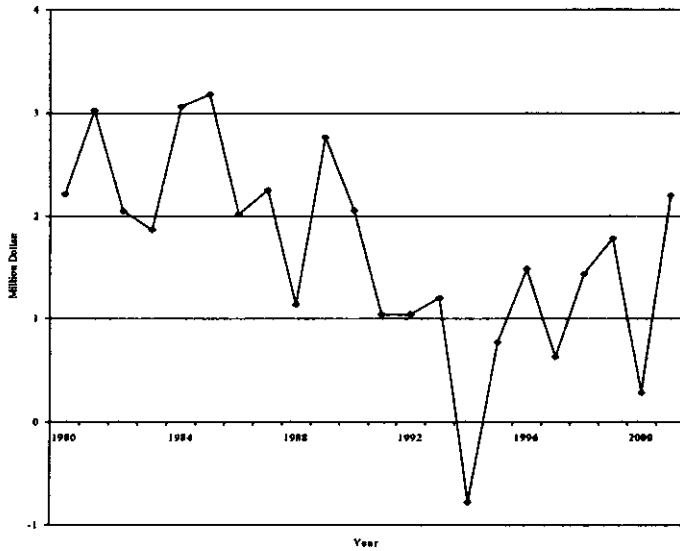


Panel B

Figure 4. Current and deflated value of Southeast U.S. shrimp processing activities (panel 5.a) and relationship between the deflated processed price and deflated dockside price (panel 5.b), 1980-2001



Panel A



Panel B

Figure 5. Average per firm processed output and deflated value of output (panel 6.a) and estimated average gross margin per firm (panel 6.b), 1980-2001

Estimated Marketing Margins

Evaluating only the output price may not provide an accurate depiction of the potential changes in the profitability in the Southeast shrimp processing sector. Specifically, the price of the raw material (i.e., the raw shrimp product) being used in processing activities may be declining by an equivalent amount. If this is the case, the marketing margin, defined as the difference between the output price and the price of the raw material being used in the production process, would remain constant; suggesting that there may be no change in profitability (The marketing margin is not a direct measure of per unit profitability. Rather, profitability, along with all other production/marketing costs, such as labor and transportation, comprise the marketing margin. Subtracting all production and marketing costs from the marketing margin would result in an estimate of profitability. These costs, however, are not readily available). Unfortunately, the price of the raw product used in processing activities is not collected by NMFS. While the price of the raw product used in processing activities, which is comprised of a combination of both domestic landings and imports, is not collected by NMFS, the dockside price of the domestically harvested product is readily available. To the extent that this price also adequately reflects the price of imported product used by the processing sector, a meaningful estimate of the marketing margin can be derived.

The difference between the dockside price (expressed on a headless weight basis) and the processed price (expressed on a headless shell-on weight equivalent basis) is illustrated in Figure 4.b. Overall, the 'estimated' marketing margin has declined substantially with most of the decline occurring since the early 1990s. This is certainly one indication that per unit profitability is falling and provides a rationale for the substantial exit behavior observed since the early 1990s.

Coping With a Declining Marketing Margin

One can hypothesize that the Southeast U.S. shrimp processing establishments have coped with the declining per unit profitability by increasing output. Overall, production averaged about 1.3 million pounds per firm during the early 1980s (Figure 5.a). By 1999 - 2001, this average had increased to more than 3.2 million pounds. The deflated value of output per firm averaged about \$9.5 million during the 1980 - 1982 period and advanced to over \$12 million during 1999 - 2001. This most recent three-year average, however, is substantially above that observed during the previous two decades (by about \$2 million) and only additional observations will indicate whether it can be maintained.

Taking the analysis one step further, we can examine changes in the average gross marketing margin per processing firm; defined as the total deflated processed shrimp sales less the cost of raw material. Prior to the early 1990s, the deflated gross margin per firm, with few exceptions, averaged from about \$2.0 million to \$3.0 million per year (Figure 6.b). This fell substantially during most of the 1990s though the 2001 figure does indicate a relatively high gross margin in that year.

A Closer Look at the Deteriorating Marketing Margin and Products Produced

The Southeast shrimp processing sector marketing margin deteriorated throughout the 1980 - 2001 period and particularly since the early 1990s. While the increasing import base has certainly contributed to the decline in marketing margin, the changing composition of imports has been as relevant, if not more so, in contributing to the decline. To see why this is the case, one can undertake a more detailed examination of Southeast shrimp processing activities, specifically, considering the specific products being produced. For purposes of analysis, the three primary products produced in the Southeast U.S. headless shell-on, peeled (raw or cooked), and breaded shrimp are considered. 'Other' products, such as canned shrimp and dried shrimp, are not considered.

Headless shell-on shrimp — Production of headless shell-on product by Southeast processors varied from a high of 127 million pounds in 1986 to a low of 66 million pounds in 2001 (Figure 6.a). There is certainly no upward trend in the production of headless product and it is worth noting that the 100 million pound mark has not been exceeded since 1990. By comparison, the 100 million pound mark was reached in seven of the 11 years during the 1980 - 1990 time frame (Figure 6.a). Furthermore, there was a relatively strong relationship between Southeast U.S. landings prior to the early 1990s and headless shell-on production. This relationship has since become considerably weaker.

The association between landings and headless shell-on production is lessening and overall production of headless shell-on product has apparently declined since the early 1990s. To understand why this is occurring, it is important to recognize that shell-on production is largely derived from domestic product. Thus, one would not anticipate any long-term increase in headless shell-on output in the absence of a concomitant increase in landings. However, the domestic product (i.e., landings) used in the production of headless shell-on product is also used in the production of other processed products; primarily the peeled product. Hence, there is competition for the raw product and the amount that would be used in headless shell-on activities would be directly related to economic conditions in both the headless shell-on sector as well as in the peeled sector.

While total Southeast headless shell-on production has declined since the early 1990s, production per firm has shown a moderate increase since the early 1990s (Figure 6.b), the outcome of a declining number of firms. The deflated price of the headless shell-on product, as indicated in Figure 6.c, fell from between \$7.20 to more than \$8.00 per pound during the early 1980s to about \$5.50 per pound in the early 1990s. Since the early 1990s, however, the price has remained in the relatively narrow range from about \$4.90 to \$5.50, with the exception of 2001 when it fell to \$4.45 per pound. The 2001 decline in price may help to explain record low headless shell-on production in that year (see Figure 6.a).

The steep decrease in the headless shell-on product price during the 1980s likely reflects primarily the large increase in headless shell-on imports during

the period (328 million pounds in 1990 compared to about 140 million pounds in 1980). Imports of headless shell-on product during the 1990s and through 2000, by comparison, were relatively stable, helping to explain the observed stability in the headless shell-on processed price. With a 100 million pound increase in headless shell-on imports in 2001, however, a decline in the domestic processed headless shell-on price was inevitable. Given the weak economy in 2001, one might have anticipated an even greater reduction in price, which equaled 10 %.

Peeled shrimp — Production of peeled shrimp by Southeast U.S. processors has expanded significantly since the early 1980s (Figure 6.a). During the 1980-82 period, for example, output of peeled shrimp averaged 46 million pounds (product weight) annually. By 1999 - 2001, output had expanded to an average in excess of 105 million pounds. In general, there was a rapid rise in peeling activities during the 1980s. From 1990 through 1998, annual peeled output was relatively stable, with annual production falling in the relatively narrow range of about 80 million pounds to about 90 million pounds. The 1999 - 2001 period can be characterized as record production.

What explains these observed changes? First, the raw material supply has obviously increased. This increase reflects both domestic landings, which would otherwise have gone primarily into headless shell-on activities, as well as imported product. Furthermore, as imports of peeled product expanded, the marketing margin for the domestically peeled product undoubtedly narrowed. Maintaining a given level of profitability in the face of a narrowing marketing margin required higher output per firm. Output per firm did, in fact, increase significantly during the 1980 - 2001 period (Figure 6.b). While the increase in output per firm was observed throughout the period of analysis, it was particularly heightened during the most recent three years. This likely reflects, primarily, the extremely large increase in imported peeled product and, hence, reduction in marketing margin which, for a given level of profitability in the domestic sector, required a large increase in output per firm.

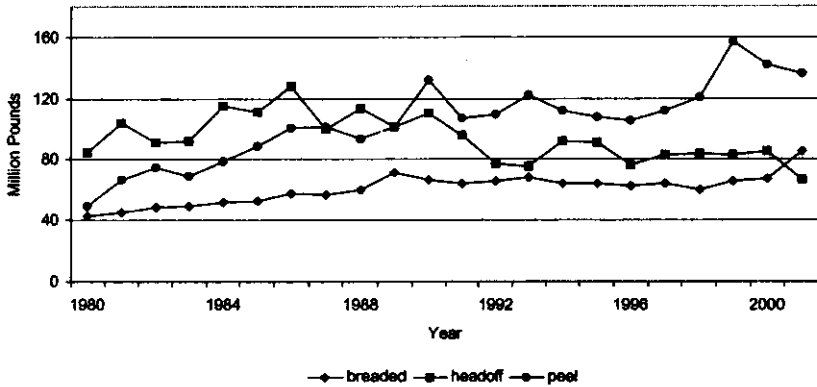
The price of the Southeast U.S. peeled product is presented in Figure 6.c. While it fell significantly during the decade of the 1980's, it remained relatively stable from 1990 through 1997, ranging from about \$3.80 to \$4.20 per pound (product weight). In three of the four years since 1997, however, price was below \$3.60 per pound and in 1999 it was just over \$4.00.

Breaded shrimp — The Southeast U.S. output of breaded product (product weight) has, since the early 1990s, consistently fallen in the relatively narrow range of 95 million pounds to 105 million pounds (Figure 6.a); a considerable increase from that observed in the early 1980s. According to Keithly and Roberts (1995), virtually all breading activities are use imported material in the production process.

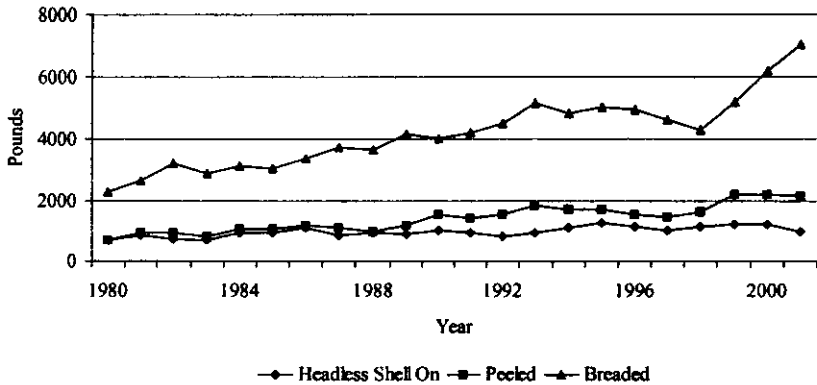
When evaluated on a per firm basis, production of breaded product averaged 7.0 million pounds in 2001 which is a significant increase when compared to the average of about 2.3 million pounds to 3.2 million pounds produced in the early-to-mid 1980s (Figure 6.b). Much of the increased output per firm has transpired since the late 1980s which coincides with

increased Asian exports, including peeled product, to the United States. This imported peeled product is used extensively in the domestic breading sector (Keithly and Roberts, 1995).

The inflation-adjusted price of the domestically produced breaded product has fallen from well over \$6.00 per pound in the early 1980s to \$3.32 per pound in 2001 (Figure 6.c). The 2001 price, however, actually exceeded the price observed in many of the other years dating back to 1993.

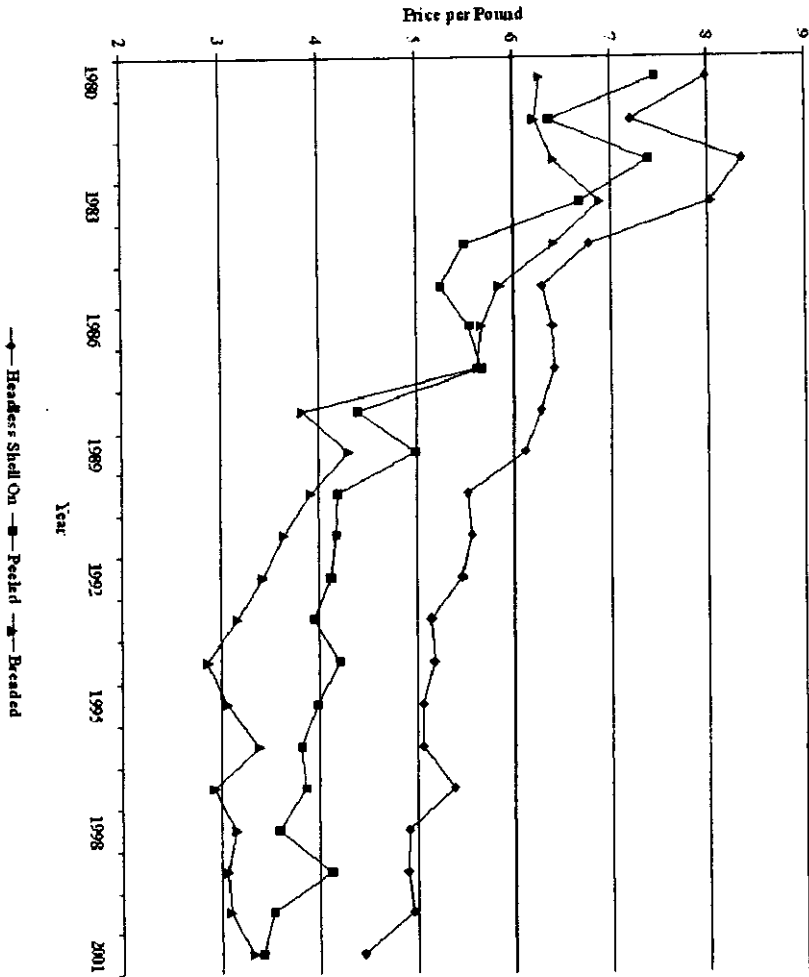


Panel A



Panel B

Figure 6. Selected statistics related to product types produced by Southeast U.S. shrimp processors. Panel 6.a shows processed poundage by product type and Panel 6.b shows average per firm production by product type



Panel C

Figure 6. Selected statistics related to product types produced by Southeast U.S. shrimp processors. Panel 6.c shows prices by product type

WHAT'S IN STORE?

There is an adage that the only sure things in life are death and taxes. While true, the strong trends discussed in the previous sections of this paper, along with economic theory, allows us to make some observations regarding future conditions in the Southeast U.S. shrimp processing sector with a fair amount of confidence. These predictions are predicated, of course, on the assumption that world production, particularly that of farm-raised shrimp, will continue to increase and that a significant proportion of the increase will be directed to the U.S. market. Furthermore, it is assumed that increased pre-export value-added activities will continue to be the norm. To the extent that these assumptions are not valid, the conclusions derived below become much more tenuous.

The first conclusion is that the processed price for the various products will, in the long run, continue the observed downward trend, and the marketing margin will continue to narrow. The continued narrowing of the marketing margin leads directly to the second conclusion: consolidation in the industry will continue. While the degree of consolidation is a matter of extreme speculation, there is considerable less uncertainty around the forecast that consolidation will occur. The final conclusion is that the average production per firm will continue to increase. This conclusion is linked directly to the previous two conclusions. Specifically, a narrowing of the marketing margin implies that increased output per firm will be required to maintain a desired level of profitability. Given the declining number of firms, furthermore, domestic landings will be divided among a fewer number of firms.

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