Investment and Income Responses to Marketing Channel Choice

Hamish R. Gow and Aleksan Shanoyan

University of Illinois at Urbana-Champaign

Selected Paper

AAEA Annual Conference

Long Beach, July 2006

Area of Focus: International Development

Investment and Income Responses to Marketing Channel Choice

The international development community has recently shifted away from the traditional technology-push paradigms towards the promotion of market-driven approaches that link farmers to markets as the new basis for economic development (World Bank. 2003; USAID, 2004). These new initiatives are recognize that globalization is rapidly changing the structure of agriculture and food procurement channels and unless development programs actively facilitate farmers' access to these new marketing channels, farmers will be forever excluded and constrained to poverty (Reardon and Berdegue, 2002; Reardon et al, 1999). The paradigm change however raises the important question about what is the appropriate marketing channel to use and how do third parties facilitate their establishment in an economically sustainable manner.

Recent research by Key and Runsten (1999), Gow and Swinnen (1998; 2001), GOw et al (2000), Dries and Swinnen (2005) and others show that the presence of a combination of factors is essential to the establishment of economical sustainable, mutual beneficial and welfare increasing marketing channel relationships including macroeconomic stability, credible and self-enforcing contractual relationships, and foreign direct investment. Their research indicates that although not theoretically required, the presence of foreign direct investment (FDI) is a necessary condition for economic development. They show that entry of FDI into a market brings credible and enforceable contracts, financial resources, technology and know-how, transparency and competitive market pressures. These factors combine to correct farmers' incentives and result in substantial positive direct and indirect income growth, investment growth and overall economic welfare growth driven through various vertical and horizontal spillovers.

An important policy question remains as to whether similar positive vertical and horizontal gains can be achieved without the presence of FDI. That is can a third-party government or non-government organization design, implement, and establish facilitation programs the effectively replicate the private FDI induced initiative, achieve similar responses and ensure long-term economic stability.

The Armenian dairy sector provides a natural experiment for analyzing the impact of third-party marketing channel establishment and facilitation programs, as Armenia is a controlled and bounded environment that has received no FDI. Within this sector the USDA Marketing Assistance Program (MAP) is the exogenous third-party shock that replicates FDI. Starting from 1998, USDA MAP initiated a series of marketing, technical and financial assistance programs in the Armenian dairy industry to facilitate the establishment of cooperative and private marketing channels to assist farmers access the market. In this paper we analyze and measure the impact that these alternative cooperative and private marketing channel choices have on farmers income and investment responses.

During the spring of 2004 an extensive survey of 745 dairy farmers was conducted in 33 villages of Armenia's major dairy producing regions to measure and evaluate both the short and long-term impact and response of farmers to the USDA MAP involvement in the Armenian dairy sector. Our results empirical results indicate a substantial shift from personal consumption of milk to commercial marketing through either milk marketing associations or private marketing channels during the period 1999 to 2004. This shift is accompanied by substantial increasing in investment (number of cows) and income. The empirical results indicate that XXXX

The rest of the paper is structured as follows. The first section discusses the historical development of the Armenian dairy industry from soviet times to late transition. The second, third and fourth sections discuss the USDA MAP, current structure of Armenian dairy industry and their involvement respectively. The fifth section discusses the research methods and data collection.

Historical Development of the Armenian Dairy Industry

During the Soviet era of the 1970s and 1980s the Armenian government encouraged the development of the domestic livestock sector through the provision of high investment and operational subsidies along with inflated market prices. These programs fostered: the overuse of high cost imported feeds; the development of capital and labor intensive operations; the waste of equipment, energy and other inputs; and the concentration of large numbers of animals (World Bank, 1995).

Independence from the Soviet Union, market liberalization, and imposition of economic blockades placed the Armenian livestock industry under extreme economic pressure: producers' costs increased substantially for imported feed and inputs; by 1994 they were 50 percent higher than farmgate output prices. Forage production dropped dramatically as farmers shifted production from perennial forage crops to storable annual crops in response to food security concerns (Figure 1). And decreased consumer purchasing power depressed consumer demand and lowered output prices (World Bank, 1995). The result was the failure of Armenia's traditional large-scale dairy operations that were no longer economically viable (World Bank, 1995).

In response the government implemented a livestock privatization program overseen by village councils to distribute five cattle and 20 sheep per to the thousands of newly independent farmers (Sardaryan, 2001). Farmers purchased the cattle for very low, largely symbolic, prices. These low (substantially below market) purchase prices - when coupled with inadequate livestock housing, poor and costly feed, severe financial distress and substantial payments delays by state owned enterprises - meant farmers often sold their cattle for an immediate cash windfall (World Bank, 1995). As a result the livestock sector contracted dramatically in the late eighties and early nineties (Figure 2; Figure 3). The worst-affected industries were pigs and poultry where numbers were down 75 percent; however cattle numbers declined by almost 50 percent (Figure 2) and by 1994, with few exceptions, most large-scale intensive dairy operations had been either shut down or drastically down-scaled (World Bank, 1995).

Farmers were not alone: the dairy processors faced similar chain coordination, procurement, and marketing problems that resulted from a combination of independence, the economic blockades, land privatization, decreasing cow numbers, reduced consumer purchasing power, limited working capital, and other related events. These problems forced processors to either close or severely reduce output during the early nineties that resulted in a dramatic drop in capacity utilization.

By 1994 however cattle numbers began stabilizing as farmers retained them as a source of dairy protein for the family household, as an income source, and as a savings instrument to protect their wealth during hyper-inflationary periods (Figure 2). Many Armenia farming families had sufficient cows to meet their own household requirements but due to the breakdown in marketing channels and lack of storage facilities and

transportation meant that they faced difficulty marketing their excess milk to processors. Consequently many dairy processors relied on imported dry milk powder to meet their procurement requirements during this period.

These transition-induced problems made recovery of the Armenian dairy industry a difficult proposition. At the farm level, transition had left farmers financially distressed, credit constrained and unprofitable due to increased input prices, decreased output prices, and limited market opportunities for selling their milk surplus. Farmers retreated to subsistence agriculture or barter as a result. Similarly dairy processors were constrained by poor quality milk supplies that arrived in inconsistent quantities from farmers, limited financial capital, inexperienced management stuck in a Soviet era mentality, poor sanitation, poor safety standards, high cost imported milk powder, and finally, inadequate or missing procurement relationships with farmers. The result was a dairy sector in total disarray.

Unlike many CEE countries that had faced a similar collapse during early transition, Armenia could not rely upon the rapid entry of multinational food companies to quickly restore an economically viable market structure (Dries and Swinnen, 2004; Dries et al, 2004; Dries and Reardon, 2005). With its small domestic consumption base, both in terms of population and purchasing power, Armenia provided an unsuitable foreign investment opportunity for multinational food companies. Consequently, dairy industry's revival would require an alternative external shock, this came from US government ODA.

Establishment of the USDA Market Assistance Program

The Armenian government approached the United States government in 1992 with a request for assistance in facilitating agricultural transition. In 1992 the USDA initially followed a traditional extension-driven technology-push international development approach by placing a policy advisor at the Armenian Ministry of Agriculture and later in 1993 assisting in the creation of an Armenian extension service. However, after three years of operation it was apparent that the production focus was not meeting industry needs. So in 1996, a USDA advisory team redesigned the project from technology-push to market-pull and with that shifted the focus from farmers and production to market and business development and the economic recovery of the privatized food processing sector. The result was the USDA Marketing Assistance Project (MAP). Essentially, MAP changed the question from, "What can we produce?" to "what does the market demand and how can we profitability meet this demand?"

The USDA MAP used an integrated market driven approach to business and market development encompassing marketing, financial and technical assistance. This integrated approach enabled USDA MAP to assist targeted clients: identify potential market demand; develop appropriate marketing channels through marketing assistance; develop new products to meet the demand through technical assistance; and provide via various instruments the necessary finance resources to mobilize the other components. The USDA MAP was careful to only draw clients (entrepreneurs, farmer groups and processing firms) from agribusiness sectors identified as having the potential for economic recovery (such as cheese processing, vegetable processing, and wine production), even through they could have been harshly affected by transition.

To implement its programs, USDA MAP drew upon a permanent Armenian staff and various visiting American university faculty and industry volunteers to provide the marketing, financial and technical assistance to their clients. Since its inception, MAP has worked with more than 65 different processing firms, who employ more than 2,600 full time staff and 1,100 seasonal staff and purchase raw materials from 18,000 farmers. At the farm level MAP has facilitated the establishment of 33 farmer marketing associations in the dairy cow, dairy goat, and fruit and vegetable sectors, the establishment of 48 production credit clubs which provide short term finance for farmer groups, and has provided specific technical assistance to farmers in areas such as goat and dairy husbandry and water management. Programs for research, youth, and undergraduate and extension education are additional areas within the project.

When the USDA MAP project was established in 1996 it was targeted at improving the livelihoods of rural Armenians, within the fruit and vegetable sector. However, towards the end of 1997, Gagik Sardaryan, USDA MAP Economic Development Advisor, questioned MAP's sole focus on the fruit and vegetable sector and challenged management that if the project was intended to benefit rural Armenians, then a large proportion of the rural population were not receiving assistance. Sardaryan was referring to the rural population residing mainly in Northern and Southern Armenia who did not grow fruit and vegetables as it was infeasible and instead derived the majority of their household income from livestock. Sardaryan's proposed that USDA MAP shift attention and resources toward assistance for and the development of the dairy industry.

Armenian Dairy Industry

The dairy industry is currently Armenia's largest agricultural sector with 55 percent of Armenia's 335,000 farmers owning 262,000 dairy cows. Most herds are dual purpose and owned by small family farms. Armenian farms have on average 0.93 cows, with about 66 percent of farms with cows owning five cows or less. Milk is traditionally used for household purposes with any surplus sold to a dairy processor, marketing association, private trader, or in the local market. The average annual milk yield is 1,700 lt/cow/year, compared to 2,400 lt/cow/year during the Soviet era, approximately 3500 lt/cow/year in Central and Eastern Europe, and approximately 7,500 lt/cow/year in the U.S.

Milk production is substantially compromised by low genetic potential, poor pastures and pasture management systems, inadequate housing, limited low nutritional winter feed, poor herd health, and a general lack of animal husbandry and management skills (World Bank, 1995). Pastures are owned and managed by the village; hence pastures suffer from poor quality, under-investment, over-use and poor management given their common-good status. This is compounded by a lack of improved pasture species, inadequate fertilizer, and poor grazing management techniques. Poor housing conditions with inadequate ventilation and poor quality bedding material lead to cow health and milk sanitation problems. Finally, many farmers only began dairy farming after the fall of the Soviet Union thus lack sufficient modern farm management knowledge.

The processing sector is characterized by a few large dairy processors located around the capital Yerevan and then numerous smaller cheese and dairy processors located around the country in specific dairy farming areas. Some of the larger facilities are redeveloped

Soviet factories; however the majority of large processors have invested in new plants. The smaller facilities have generally been established by independent entrepreneurs, many of whom previously worked in the state dairy processing facilities during the Soviet era. These facilities often began life adjacent to the entrepreneur's home or in their backyard. Overall, the quality of Armenian dairy products is low, although there is an increasing number of processors, both large and small, producing export quality products. For example, 850 tonnes of cheese was exported in 2003.

Surplus raw milk is currently purchased by processing firms through various procurement channels. The most common is direct purchase from individual farmers either by the processor collecting the raw milk from the farmer, an independent third party working between the processor and farmer, or the farmer delivering the milk directly to the processing facility. With the assistance of USDA MAP a number of marketing associations with milk cooling tanks have been established. These associations collectively sell the milk of their members directly to processors. One large processor centered in Yerevan has developed a series of privately owned collection centers with cooling tanks around the country which they use to accumulate milk before transporting to their Yerevan processing facility.

The Dairy Processing Sector

Once given the green light, USDA MAP completed a series of feasibility studies, market research, and industry analysis to identify firms and regions that were in need of assistance. USDA MAP personnel recognized that for their program to be successful, it was critical that the client firms or farmers associations must develop long-term

economically sustainable business models that were driven by the market and client firm and not USDA. Consequently, client identification and screening was critical. Potential clients were only selected for assistance if their management team possessed sufficient entrepreneurial ability and business acumen to succeed along with sufficient social capital within the local community to that they could mobilize local producers.

Recognizing that the key to rural development was the establishment of a long-term economically sustainable downstream market for farmers, the USDA MAP strategically aimed the majority of their assistance towards market development for the processing sector with the idea that the economic benefits would spillover and accrue to farmers through backwards vertical spillovers.

Three processors were initially selected by Sardaryan and his team for assistance in 1998. Since then USDA MAP has granted assistance to processors that have approached them based upon the set criteria and provided them with a flexible and customized package of financial, technical, and marketing assistance aimed at increasing production, improving product quality, and market access (Table 1). Initial assistance generally consisted of financial and technical assistance to increase production and improve product quality. Once producing sufficient quantities of a high quality product, USDA MAP would follow with marketing assistance.

Financial assistance was delivered in various forms. Initial assistance usually comprised: grants for facility renovation, purchasing cheese making technology, cultures and training; working capital loans to purchase milk during the peak season; and leases for capital assets, pasteurizers, milk cooling tanks, and other capital equipment. Although

grants provide misaligned incentives compared to leases or loans, they were initially seen as a necessary evil required to sufficiently the financial situation of many processors to ensure sustainable platforms for later economic growth.

Technical assistance was directed towards improving both raw milk procurement and final product quality. At the farm level USDA MAP provided technical assistance to processors and their farmer suppliers on milk procurement and increasing the quality of raw milk sourced from farmers. At the processing level, assistance supported sanitation, cheese making, design of processing facilities, membership in the Larry Cheese Union, and educational trips for managers to Poland and the U.S.

Marketing assistance focused on providing dairy processors with promotional assistance, trade show support, market linkages, export assistance and new product development. USDA MAP often assists clients first export shipments, but then left them alone to manage their markets for themselves. New clients often request and were granted new product development assistance. This assistance helped increase the range of product offered and to offset import competition of European style cheeses.

Over the period 1998 to 2002, USDA MAP assistance grew substantial both in individual assistance and number of processors assisted (Table 1). The number of processors assisted increased 88 percent. The number of employees per processor increased 175 percent and the number of suppliers per processor increased 160 percent. Additionally 33 percent of the processors producing and exporting export quality cheeses.

Research Methodology and Data Collection

This research is concerned with the empirical analysis of the income and investment responses of Armenian dairy farmers to third party facilitated (USDA MAP) private and cooperative market channels to the alternative tradition marketing channel options. This research is similar to the recent stream on the impact of private solutions in CEEC agriculture (Gow & Swinnen, 1998; Foster, 1999; Gow & Swinnen, 1999; Gow *et al*, 2000; Walkenhorst, 2000; Gow & Swinnen, 2001; Dries & Swinnen, 2002a; 2002b; Cocks & Gow, 2003a; 2003b). The complication, however, centers on the specific context of the Armenian case. While private solutions to the problems of transition have been found and developed in other CEEC, they have not been seen in Armenia. However one unique publicly third party facilitated case has been observed that seems to be solving the problem in Armenia, the USDA Marketing Assistance Project (USDA MAP).

From the initial research in 2002 the research team became interested in empirically evaluating and modeling the impact of the USDA MAP facilitated marketing channel relationships on Armenian dairy farmers. To do this we initially followed a systematic mixed methods grounded theory approach to the data gathering and analysis (Strauss Corbin, 1994). This inductive research approach allowed us to first develop critical new theoretical insights in to the instrumental case under analysis as well as identify the critical initial conditions, process components and characteristics for later quantitative analysis.

The initial data collection took place during the fall of 2002 using a combination of unstructured interviews and participant observation (Atkinson & Hammersley, 1998).

Nineteen unstructured interviews were conducted with agroprocessing firm managers and USDA MAP consultants and management. Participant observation allowed the authors to develop a greater understanding of the relevant issues at USDA MAP where they actively participated in USDA MAP management meetings, programs, activities and client interactions. From this initial grounding a series of critical issues were identified, thus interviews became more structured to extract a deeper understanding of the specific issues relating to the dairy industry case.

Semi-structured interviews were them employed to gain further understanding into the underlying critical issues, yet still allow flexibility in the direction of the interviews. As Stake (1995) argues, case study fieldwork often takes the researcher in unforeseen directions so having a less structured approach to data collection allows the discovery of relevant and important information that the researcher may not have initially considered.

During November 2003 seventeen semi-structured interviews were conducted with cheese and dairy plant managers, owners and presidents, milk marketing association managers and presidents, short and long term USDA MAP consultants, the resident long term project leader and dairy advisor, USDA MAP permanent staff. Data triangulation was achieved through interviewing multiple parties within each of the relevant groups (Stake, 1998).

Secondary data were collected through a range of publications on Armenia and Armenian agriculture, consultancy reports, proposals, and management plans which dated back to the start of the project in 1998.

Quantitative data was collected with a survey instrument specifically designed, tested, and implemented to measure the impact of the USDA MAP program and farmers responses. A stratified random sampling frame was used to purposively select nine groups, or strata, each containing three villages. The survey followed a similar design to Dries and Swinnen (2002a; 2002b), Hansen et al (2002), and Simmons et al (2003). The survey had eight sections covering questions related to the milk marketing association, financial information, land use and ownership, demographics, general agricultural production, specific goat production, investment, and finally farmers involvement in the association and community. The survey was extensively pilot tested and double blind reverse translation was used to ensure that the survey questions had the right meaning.

The survey was administrated during the winter of 2004. 745 dairy farmers were surveyed. Each survey was personal enumerated and took between one and two hours to complete. The survey results were coded, cleaned, and entered into SPSS for analysis.

Farmer Income and Investment Responses

Recognizing that assistance beginning from 2000 may have affected the structure of dairy milk marketing in Armenia, the survey instrument included reflectionary questions back to 1999 designed to elicit any changes in marketing over time. It is important to recognize that in some Marz (areas) and villages, formal marketing channels were available in 1999, but these were not linked to the USDA MAP. In other Marz and villages no formal marketing channel existed in 1999, as neither a private dairy processor nor a USDA MAP facilitated collection center was available. Consequently farmers marketing decisions were constrained by the available options.

The survey instrument separated out 10 different marketing channel structures and farmers were asked in each year to specify the channel where the majority of their milk was used. For ease of analysis these channel choices have been compressed into four aggregate variables that best reflect the organization structure of these channels: Cooperative (COOP), Private channel (PRIVATE), Personal Consumption (HOME), and other (OTHER). The *Cooperatives* grouping includes all farmers who are selling to one of the farmers associations that cooperatively own and operate the milk cooler and collection centers; *Private Channel* which includes the delivery of milk directly to a milk plant or privately owned collection center; *Personal consumption* which includes personal consumption as liquid milk and as a processed milk product, probably cheese; and *Other* which includes barter, sale of fresh milk and milk products in the local village or market, and sale to traders or middlemen. Table 3 summaries the changing choice in marketing channel used by farmers over the period 1999 to 2004 in each of the eight marz. In most Marz a dramatic shift towards commercial marketing channels (*cooperatives & private*) can be observed when those channels are available. For example in Lori Marz, 50% of the farmers who had either been selling their milk through informal channels (*other)* or *personal consumption* in 1999 shifted to marketing their surplus milk through formal channels (*cooperatives & private*). Similar shifts can be observed in Tavash, Aragatotn, and Gerharkunik Marz. In Syunik Marz, where no commercial milk processor operated, the introduction of a farmers association resulted in a rapid shift to this *cooperative* marketing channel over the six years. Similarly in Kotayk and Shirak Marz similar shifts to commercial *private channels* were observed. Although the speed and number of farms shifting varies across Marz, a clear picture

develops out of Table 3 showing that the majority of farmers who previously sold their surplus milk through the ad hoc informal marketing channels (*other*) rapidly switched to commercial channels (*cooperatives & private*) once they become available. Similar, but not necessarily as dramatic shifts are seen from *personal consumption* to commercial marketing (*cooperatives & private*). This slower response may result from farmers in these marz having alternative income sources.

To better understand the impact of these new marketing channel opportunities on farmers, we have graphed and conducted t-tests and ANOVA on the resulting investment decisions (number of cows) and income derived from the alternative marketing channels compared to comparable farmers within the same village groupings. Figures 1 and 2 shows the resulting dynamics for Group 1 where farmers associations have become the dominant marketing channel by 2003. The t-test results indicate that the numbers of cows per farm and income levels per farm for Cooperative group are not statistically significantly different from the other three comparison groups in both 1999 and 2003 at the 10% significance level. However when the change in numbers of cows and income over time was tested across groups, we find that the slope of change in income for the cooperative group is statistically different with a 5% significance level, compared to each of the other three groups. This indicates that although we do not observe a statistical difference in absolute values, the farmers who joined the associations started with a mean income below both personal consumption and private market and have observed the largest gain in income of the 5 year period. A possible explanation for the observed results is that the farmers who initially faced low levels of relative income compared to their village peers had the appropriate incentives to band together and collectively

approach the USDA MAP for assistance in establishing a cooperative compared to their peers who, although not having statistically different incomes, are observably better off than the farmers association members.

Figures 3 and 4 show the results for Group 2 where delivery to a private dairy processor or collection center has become the predominate channel of choice. These results indicate a quite different set of responses. Firstly, the farmers delivering to the private channels have statistically significantly more income and number of cows over all years than their fellow villagers as well as all villages in Group 1 or 3. Additionally, the rate of increase in cow numbers and income for private channel farmers is significantly higher than the other farmers. This seems to indicate two key outcomes. First, private dairy companies chose to locate their collection centers in villages that possess wealthier farmers with larger numbers of cows. This makes economic sense for the companies as it minimizes their procurement transaction costs. Second, once these private channels are established, farmers rapidly respond to the market incentives by further investing in dairy production.

Interestingly, the rate of growth in income and cow numbers is not statistically different between farmer association members in Group 1 and farmers marketing to private channels in Group 2. This seems to indicate that although these farmers started at statistically different resource base levels, the establishment of a suitable marketing structures and organizations coupled with the introduction of correct incentives results in similar economic responses by farmers. This finding matches the ad hoc evidence provided by Ashtarak Kat dairy processor who has recently begun shifting their focus away from establishment of private collection centers to supporting USDA MAP

established farmers associations as their preferred strategy for expansion of their procurement base.

Ordered Probit Analysis

To statistical measure the statistic impact of these separate marketing channels on farmers' income levels an ordered probit analysis was completed on both the complete data set of all 745 farmers and a partitioned dataset of 408 farmers who started in private consumption. An ordered probit analysis was required as the farmers incomes were measured in by ascending sized income blocks (Table 4). The size of each income block increases the further one gets away from zero. This analysis was completed using the statistical package STATA.

The dependent and explanatory variables are summarized in Table 4. COWS 99 and INCOME99 measure the farmer's initial situation in 1999 before the USDA MAP began. COWCHANGE measures the change in cow numbers. ANLANCUL03 measures arable cultivated land in 2003. PMCUL03 measures the amount of pastures and meadows owned and cultivated by the farmer (this does not include common village pasture and meadows). AGE and EDUC measure the age and number of years of education of the head of the household. FMEMBER measures the number of family members in the household. WAGEINC measures the proportion of household income that comes from wage income. REMINC measures the amount of remittances that are returned to the household from family members living overseas. NONAGINC measures the proportion of income that the household receives from non agricultural activities, excluding wage activities. LOANSIZE measures the current size of outstanding loans that the farmer

holds with other entities. This includes banks, credit clubs, friends and relatives. COOP, PRIVATE, OTHER and HOME are the dummy variables indicating where that the farmer marketed the major of his milk production. YRINCOOP AND YRINPRIVATE are variable that measure the number of years that the farmer has been marketing his milk though either of these channels.

The results of two separate ordered probit models are estimated and shown in Table 5. The models use dummy variables COOP, PRIVATE and OTHER to measure the marketing channel that farmers where selling though in 2003 with HOME being the residual channel. The results from the first model *full sample* shown on the left of the table use the complete 708 farmers in the dataset irrespective of which marketing channel they sold milk through in 1999. The second model *partitioned,* to the right, shows the results for farmers who were using all of their milk for personal consumption in 1999, but in 2003 could have been selling through any of the four channel options.

Just as the previous graphical analysis indicated, the farmer's initial conditions in 1999 INCOMWR99 and COW99 have positive and statistically significant impact on the farmers income in 2003. Similarly, change in cow numbers of the past 4 years and amount of cultivated arable land have positive and statistically significant impact of farmer's income. This is all self explanatory. The amount of owned pasture and meadows has no impact and is likely due to the fact that most pasture and meadow is common property to the whole village. So the number of cows or income is not constrained by ownership and control of pastures or meadows, but instead access and availability of suitable high quality feed on common lands. Age, education and number

of family members were all statistically insignificant. These results hold over both the full and partitioned datasets.

Evaluating alternative and supplementary source of incomes bring up some important differences and possible implications. Both WAGEINC and REMINC are positively statistically significant in the full model however their significance is reduced in the partitioned model. This seems to indicate that WAGEINC and REMINC are relatively more important sources of income for farmers who were not solely subsistence farmers in 1999. This may result from non partitioned farmers having better access and opportunity to gain both wage income and remittances due to location advantages relative to subsistence farmers. NONAGINC has a negative statistically significant impact on income in the full model, but no impact in the partitioned model. This result is likely explained by the factor that entrepreneurial individuals who pursue non-agricultural activities are likely to reinvest all of their excess cash flow back into their businesses; therefore the pursuit of such endeavors will negatively impact household income. LOANSIZE is only statistically significant for the full data, indicating that it is only farmers who were engaged in the formal channels in 1999 who have statistically been able to access and leverage external capital to increase income.

As for marketing channel choice, the results indicate that COOP is positively statistically significant in both models, whereas PRIVATE is only positively statistically significant in the full model. These results support the previous graphical analysis and indicate that private companies are likely to be choosing locations where villages have high average number of cows per farm and only farmers with sufficient cow numbers can access these channels. However, for farmers who were previously using their milk for personal

consumption and have shifted to private marketing, their income has not statistically changed with the shift in marketing channel, even though graphically a positive slope can be observed in Figure 4.

Discussion

This paper examines farmer responses to alternative third-party facilitated establishment of commercial private and farmer association marketing channels and impacts on farmers channel choice, incomes, and investment. The USDA MAP and the Armenian Dairy industry were used as an instrumental case study to gain a greater understanding of the issues, responses and impact involved in this process. The Armenian dairy industry provides a natural experiment for the evaluation of this as there has been no foreign investment within the industry nor external ODA before the USDA MAP program began in 1999. A mixed methods approach combining qualitative and quantitative data collection and analysis was used.

The results indicate that the establishment of economically sustainable marketing channels (both private and farmers associations) can have a substantial impact on local farmers. Ad hoc case evidence indicates that private processors will initially target villages with larger or wealthier farmers as their preferred location for the establishment of private collection facilities. This is supported by survey evidence. Once established farmer who market through these new channels observe faster income growth, they respond by increasing cow numbers and this builds upon itself. For villages characterized by smaller, less wealthy farmers, the introduction of the USDA MAP farmer association model resulted in similar gains, just from a lower initial starting point.

Interestingly, interview responses indicate that private processors have recognized the responses induced by the establishment of farmer associations and have recently begun working closely with the USDA MAP to support the establishment of additional associations as their preferred procurement model for expansion.

References

Dries, L. and J.F.M. Swinnen, (2004). "Foreign Direct Investment, Vertical Integration, and Local Suppliers: Evidence from the Polish Dairy Industry," *World Development*, 32(9): 1525-1544.

Gow, H.R. and Swinnen J.F.M. (1998). Up and downstream restructuring, foreign direct investment, and hold-up problems in agricultural transition. *European Review of Agricultural Economics,* 25, 331-350.

Gow, H.R. and Swinnen J.F.M. (1999). The impact of FDI in the downstream sector on agricultural finance, investment and production: evidence from the CEEC. In *Agricultural Finance and Credit Infrastructure in Transition Economies,* OECD ed., (Paris, France: OECD Publications, 1999), 184-197.

Gow, H.R., Streeter, D.H. & Swinnen, J.F.M. (2000). How private contract enforcement mechanisms can succeed where public institutions fail: the case of Juhockur a.s. *Agricultural Economics,* 23: 253-265.

Gow, H.R. and Swinnen J.F.M. (2001). Private enforcement capital and contract enforcement in transition economies. *American Journal of Agricultural Economics,* 83(3): 686-690.

Key, N., and Runsten, D., (1999). *Contract Farming, small holders,, and rural development in Latin America: The organization of agroprocessing firms and the scale of outgrower production.* World Development 27(2): 381-401.

Reardon and J.A. Berdegué, (2002), "The Rapid Rise of Supermarkets in Latin America: Challenges and Opportunities for Development," *Development Policy Review,* 20(4) September: 317-334.

Reardon, T., Codron, J-M., Busch, L., Bingen, J. and Harris, C., (1999). Global change in agrifood grades and standards: agribusiness strategic responses in developing countries. *International Food and Agribusiness Management Review* 2(3): 421-435.

USAID, (2004). *USAID Agricultural Strategy: Linking Farmers to Markets.* Washington D.C.: USAID.

World Bank, (2003). *Reaching the Rural Poor: A Renewed Strategy for Rural Development.* Washington D.C.: World Bank.

Table 1: Dairy processors receiving assistance from USDA MAP as at end of 2002

Dairy processor	Location of processor	Date of formation	Start of assistance	Milk purchased	Exports (sales value)
Agroholding	Shirak	2002	2002	58 t	-
Andranik Papikyan	Aragatsotn	2000	2001	300 t	-
Armavir Kat	Armavir	1996	2002	700 t	-
Ashtarak Kat	Yerevan	1996	2002	621 t[1]	-
Ashotsk Cheese Plant	Shirak	1996	1998	800 t	3 %
Boti Cooperative	Aragatsotn	1994	2001	615 t	7 %
Chanakh	Kotayk	1991	2000	600 t	-
Dustyr Melanya	Lori	1996	1998	800 t	52 %
Gnel Khachatryan	Gegharkunik	1997	2000	270 t	-
G. Atoyan & Friends	Shirak	1997	1998	183 t	-
Khak	Ararat	1995	2002	250 t	-
Mastarachedo	Aragatsotn	1999	2000	303 t	-
Saraghar	Tavush	2002	2002	34 t	-
Village Group	Lori	2000	2000	1,200 t	19 %
Vordi Armen	Kotayk	2000	2000	430 t	18 %

Source: USDA MAP 2002 marketing audit

Table 2: Farmer numbers and development of milk marketing association 2000 – 2003

Association (# of villages)	Region	2000	2001	2002	2003
Lejan (3)	Lori	161	411	430	496
Elita (5)	Lori	-	60	250	300
Tolors (1)	Syunik	-	67	56	54
Vahan (1)	Gegharkunik	-	45	72	110
Lendrush (1)	Shirak	-	27	0	0
Puskino (1)	Lori	-	34	56	67
Rosa (1)	Gegharkunik	-	32	31	32
Akhalatian (3)	Syunik	-	-	48	60
Khosrov Kat (1)	Ararat	-	-	-	33
Emulik (1)	Tavush	-	-	-	32
Aran-Vard (1)	Aragatsotn	-	-	-	33
Spitak (1)	Lori	-	-	-	31
Aygut (1)	Gegharkunik	-	-	-	34
Agarak (1)	Lori	-	-	-	33
Sverdlov (1)	Lori	-	-	-	32
Van (1)	Ararat	-	-	-	32
Total farmers		**161**	**676**	**943**	**1,379**

Table 3: Number of Farms per Market Channel by Marz (1999 to 2003)

MARZ	year	Cooperative	Private Channel	Personal Consumption	Other	Total
Lori	1999	25	25	49	43	142
	2000	32	28	46	36	142
	2001	47	42	26	27	142
	2002	46	44	26	26	142
	2003	48	46	23	25	142
	2004	59	43	20	20	142
Tavush						
	1999	3	2	37	11	53
	2000	5	2	37	9	53
	2001	8	2	36	7	53
	2002	10	3	35	5	53
	2003	19	4	28	2	53
	2004	21	3	26	3	53
Aragatsotn						
	1999	1	4	81	36	122
	2000	1	16	74	31	122
	2001	1	27	64	30	122
	2002	1	32	60	29	122
	2003	1	33	58	30	122
	2004	25	40	48	9	122
Syunik						
	1999	1	0	54	17	72
	2000	2	0	53	17	72
	2001	32	0	30	10	72
	2002	54	0	16	2	72
	2003	59	0	12	1	72
	2004	59	0	12	1	72
Gegharkunik						
	1999	0	1	81	32	114
	2000	0	5	83	26	114
	2001	4	19	74	17	114
	2002	5	22	72	15	114
	2003	10	29	63	12	114
	2004	34	30	44	6	114
Kotayk						
	1999	0	18	55	21	94
	2000	0	25	50	19	94
	2001	0	33	44	17	94
	2002	0	34	44	16	94
	2003	0	35	43	16	94
	2004	0	38	43	13	94
Shirak						
	1999	0	60	40	18	118
	2000	0	70	31	17	118
	2001	0	100	13	5	118
	2002	0	109	5	4	118
	2003	0	110	4	4	118
	2004	0	106	5	7	118
Armavir						
	1999	0	0	20	10	30
	2000	0	0	18	12	30
	2001	0	1	17	12	30
	2002	0	1	18	11	30
	2003	0	1	17	12	30
	2004	0	1	18	11	30

Table 4: Description of Variables

Variable Type	Variable Title	Description	Full Sample		Partitioned Sample	
			Mean	SD	Mean	SD
Dependent Variable	INCOMWR03	Farmer's income in 2003 (income categories 1to 15)	6.9825	3.7876	6.3549	3.8759
Initial Conditions & Farm Size	INCOMWR99	Farmer's income in 1999 (income categories 1to 15)	6.0175	3.5511	5.6043	3.6426
	COW99	Number of cows in 1999	3.9369	5.2538	3.3093	4.5933
	COWCHANGE	Change in number of cows from 1999 to 2003	0.8309	5.2898	0.5300	2.5019
	ARLANCUL03	Area of arable land cultivated in 2003	1.6900	3.0274	1.4145	2.0930
	PMCUL03	Area of pastures and meadows cultivated in 2003	1.5214	3.1519	0.9736	2.2251
Farmer Information	AGE	Age of the farmer (years)	45.9529	13.1179	46.7981	13.5621
	AGE2	Age of the farmer (years) squared	2283.517	1305.846	2373.548	1371.426
	EDUC	Farmer's education (years)	10.7594	2.2501	10.6322	2.1569
	EDUC2	Farmer's education (years) squared	120.8212	48.2437	117.6851	45.8336
	FMEMBER	Number of people living in household	5.5624	2.1302	5.3946	2.1132
	WAGEINC	Proportion of income from wages	0.1114	0.2206	0.1057	0.2240
	REMINC	Proportion of income form remittances	0.0284	0.1178	0.0292	0.1223
	NONAGINC	Proportion of income from non agricultural activities	0.0242	0.1126	0.0230	0.1056
Access to Credit	LOANSIZE	Amount of current loan (US $)	84.5235	673.0554	66.7866	437.8913
Marketing Channel Information	COOP	Selling milk throught Milk Marketing Cooperative (1=Yes)	0.1839	0.3877	0.1559	0.3632
	PRIVATE	Selling milk to privatelly owned processing plant (1=Yes)	0.3463	0.4761	0.2398	0.4275
	OTHER	Selling milk trough other marketing channels (1=Yes)	0.1369	0.3440	0.5707	0.4956
	HOME	Consuming milk at home (1=Yes)	0.3329	0.4716	0.0336	0.1803
	YRINCOOP	Number of years in Milk Marketing Cooperative	0.3758	0.9178	0.2206	0.6196
	YRINPRIVATE	Number of years that farmer is selling milk to private dairy plant	0.7490	1.7871	0.3525	0.8452

Table 5: Results for models with marketing channels as dummies

Variable Type	Variable Title	Full Sample		Partitioned Sample	
		Coef.	p-value	Coef.	p-value
Dependent Variable	INCOMWR03				
Initial Conditions & Farm Size	INCOMWR99	0.4674	0.000	0.5286	0.000
	COW99	0.0212	0.013	0.0235	0.062
	COWCHANGE	0.0451	0.000	0.0925	0.000
	ARLANCUL03	0.0373	0.037	0.0766	0.006
	PMCUL03	-0.0068	0.620	0.0080	0.747
Farmer Information	AGE	0.0034	0.846	-0.0271	0.262
	AGE2	-0.0001	0.398	0.0001	0.640
	EDUC	-0.0583	0.440	-0.1240	0.247
	EDUC2	0.0050	0.149	0.0077	0.116
	FMEMBER	-0.0148	0.428	0.0083	0.748
	WAGEINC	0.3307	0.065	0.3432	0.157
	REMINC	1.0912	0.001	0.7375	0.092
	NONAGINC	-1.0103	0.004	-0.3617	0.480
Access to Credit	LOANSIZE	0.0001	0.044	0.0001	0.691
Marketing Channel Information	COOP	0.5043	0.000	0.3937	0.009
	PRIVATE	0.3359	0.001	0.2102	0.126
	OTHER	0.1353	0.282	0.3777	0.194
Cut Points		**Coef.**	**Std. Err.**	**Coef.**	**Std. Err.**
	Cut1	0.0564	0.6012	-0.7951	0.8208
	Cut2	0.6971	0.6006	-0.1092	0.8202
	Cut3	1.3780	0.6008	0.6445	0.8182
	Cut4	1.6726	0.6010	1.0496	0.8169
	Cut5	2.0737	0.6020	1.4637	0.8175
	Cut6	2.6672	0.6038	2.0794	0.8208
	Cut7	3.2397	0.6061	2.7246	0.8244
	Cut8	3.6784	0.6087	3.2099	0.8272
	Cut9	4.4192	0.6131	3.9719	0.8344
	Cut10	4.9946	0.6161	4.5168	0.8409
	Cut11	5.3384	0.6184	4.9316	0.8454
	Cut12	5.8021	0.6217	5.5075	0.8501
	Cut13	6.3544	0.6280	6.2085	0.8591
	Cut14	6.7434	0.6349	6.5641	0.8666
Number of observations		**727**		**408**	
LR chi sq.		**1036.46**		**661.56**	

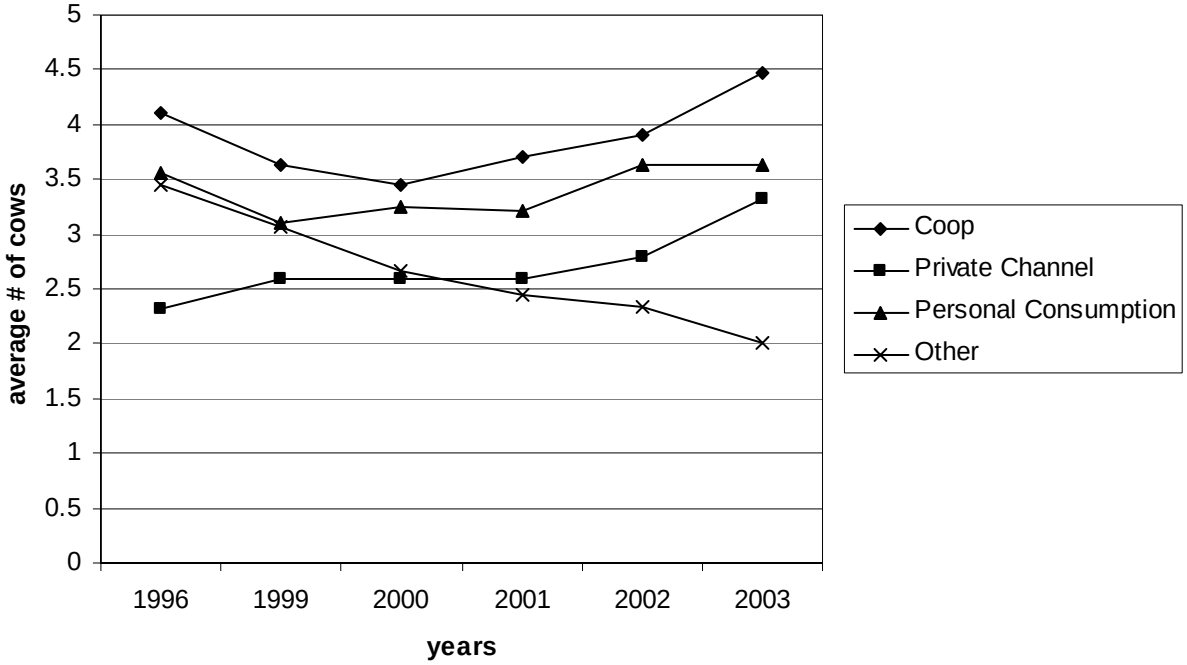

Figure 1: Change in Cow/farm from 1999 to 2003 in Group 1

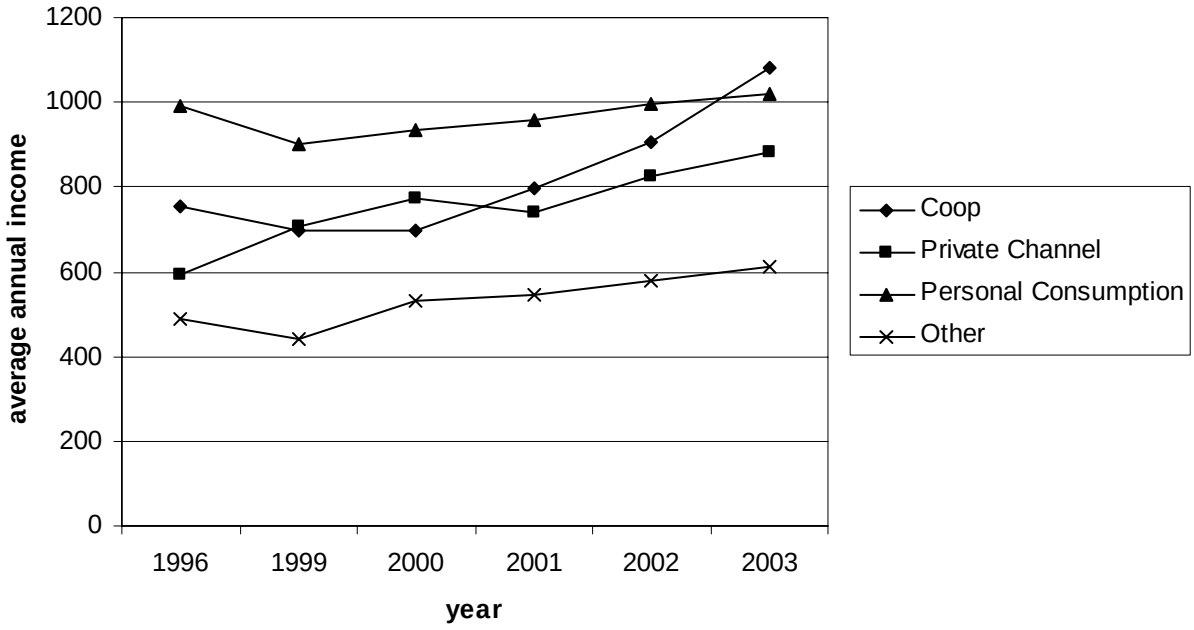

Figure 2: Change in avg. income per household from 1999 to 2003 in Group 1

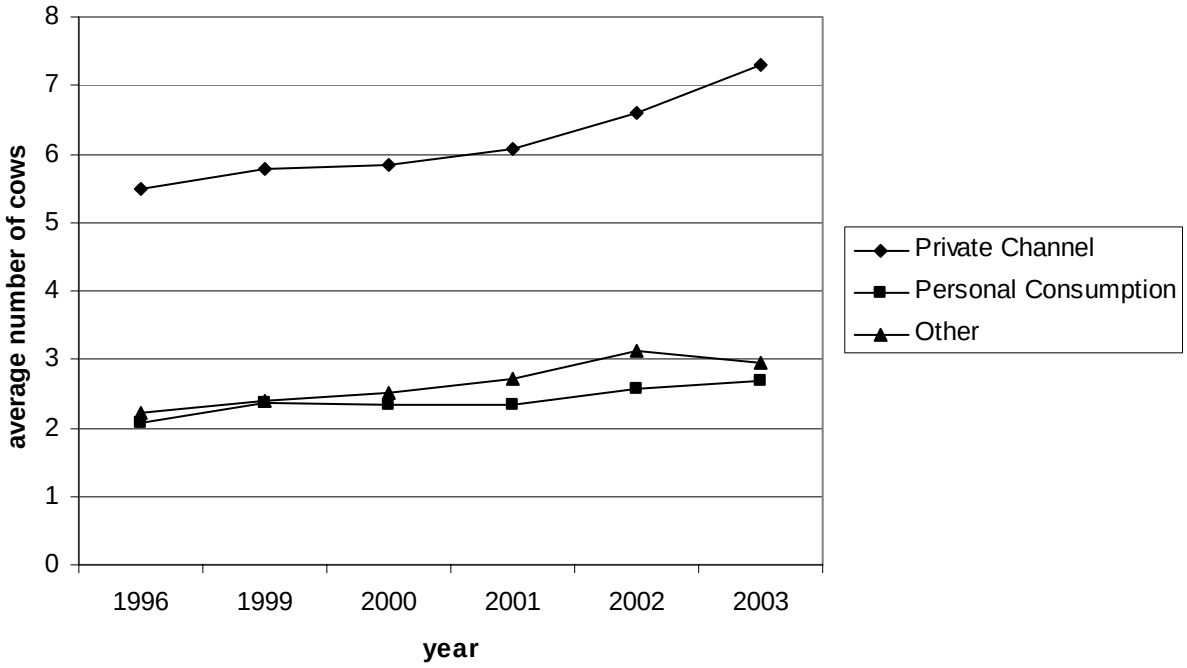

Figure 3: Change in Cow/farm from 1999 to 2003 in Group 2

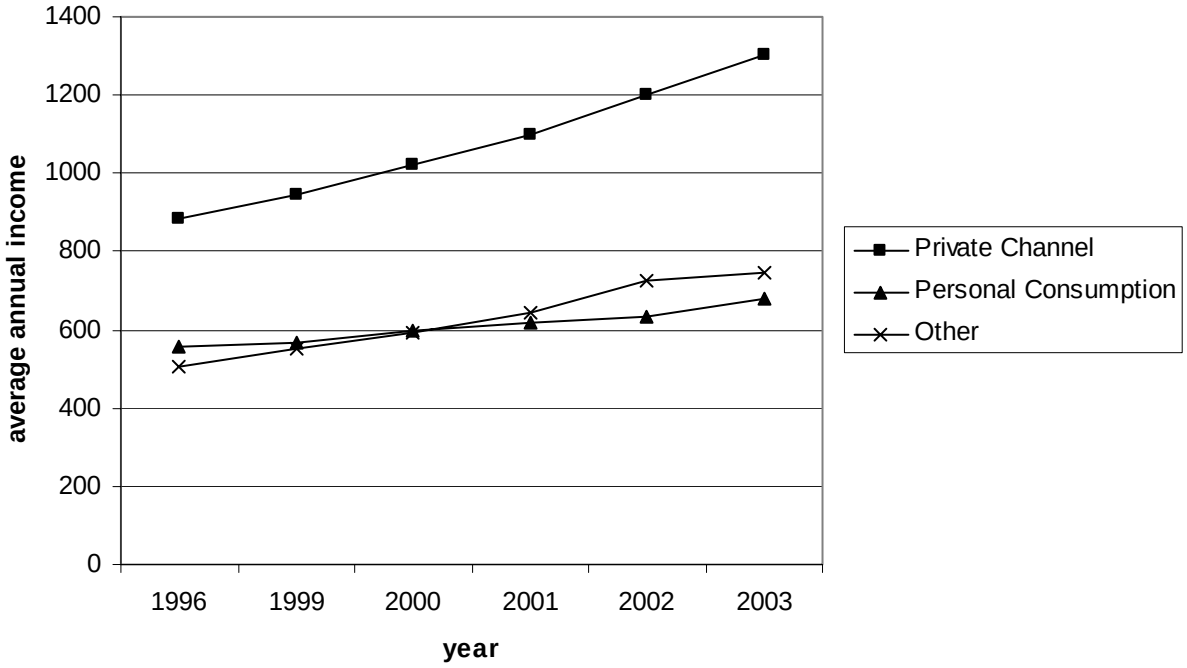

Figure 4: Change in avg. income per household from 1999 to 2003 in Group 2