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A Living from Livestock

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Poultry Supply Chains and Market Failures in Northern Viet Nam

J. Ifft, D. Roland-Holst, A. Sy, and D. Zilberman

ABSTRACT

Our farm surveys as well as other research in Viet Nam indicate that poultry production is important for the incomes of the rural poor and it is important to recognize that the poor are involved in all stages of the poultry market chain, not just in production. Poultry market channels in northern Viet Nam might be generalized into two or three major avenues: in one small scale farmers produce local chicken and sell to nearby markets or to urban areas through informal channels. In another, medium and large farms sell through formal, regulated channels such as wholesale markets. In a few cases, large companies have built their own slaughterhouses, nearing complete vertical integration. These poultry markets are at a critical juncture. The newer, more formal marketing chains are considered to be easier to regulate, however, if smallholders and / or small-scale traders cannot market local chicken through these channels, they will continue using informal channels due to the high levels of demand for the local type of chicken in Ha Noi. One element of a control strategy for avian influenza is the improvement of biosecurity of poultry production and marketing. One way to include smallholders in this process is to encourage processing of local chicken in wholesale markets and other formal market channels. A complementary option is to support market-driven methods of encouraging smallholders to reduce poultry (and associated human) health risks given that consumers are concerned about food safety and willing to pay a significant premium for credible safety-guaranteed chicken. Inclusion of branded and traceable 'safe chicken' from local varieties in urban areas can serve two goals: to reduce health risks and to decrease rural poverty.

1. Introduction

Avian Influenza (HPAI) is endemic in some ecosystems of Viet Nam, threatening public health and causing significant economic damage. The resulting challenge of managing the biosecurity of poultry production and market systems is immense. Poultry is being produced at some level by most rural households and marketed over a dispersed area with different trading systems. Market chains determine where and how poultry travels and impact where and how poultry is produced. The choice of marketing channel is impacted by production scale, poultry variety produced, contractual relations, and potential profits. Chicken varieties in Viet Nam are highly differentiated, and along with the relationship of this differentiation with production scale, market channels have become fragmented. Understanding the underlying factors that shape the structure of market chains is key for developing policy to prevent and manage HPAI risks. This paper considers key constraints in the marketing chain, and explains how marketing failures occur in urban areas.

Poultry market channels in Viet Nam might be generalized into 2-3 groups; in one small farmers produce local chicken and sell to nearby markets or to urban areas through informal channels. In another, medium and large farms sell through formal, regulated channels such as wholesale markets. In a few cases, large companies have built their own slaughterhouses, nearing complete vertical integration.

Farms still tend to be small; although the number of farms raising chicken on an industrial scale is increasing. Policy related to HPAI management should also encompass equity concerns. Poultry is important to the livelihoods of the rural poor, whether families raise a few backyard chicken for consumption or sell a few small groups of chicken every month / year into local markets. The poor are also involved in market chains as traders, slaughterhouse owners, etc.

The paper is structured as follows. First chicken production is discussed, specifically production structure and farm-level constraints. Section 3 highlights the type of contractual relations amongst different players in the supply chain. Section 4 presents scale and transportation challenges facing the current supply chain. How the current regulatory system is experienced by supply chain players is discussed in Section 5. Section 6 discusses market fragmentation, while Section 7 discusses the disconnect between urban demand for safe local varieties of chicken and the current marketing system. Section 8 concludes with a summary of findings and policy recommendations, as well as potential areas for further research. This paper draws heavily from the findings of consumer and market chain surveys conducted in Ha Noi and surrounding areas during the summer of 2007 (Roland-Holst *et al*, 2007; Ifft *et al*, 2007 and Ifft *et al*, 2008).

2. Chicken Production

Production structure for chicken is closely related to farm size in Viet Nam. A few backyard or 'local' chicken are raised by most rural families in Viet Nam. Local (free range) chicken breeds cannot be caged, do not efficiently convert concentrate feed, grow slowly but generally require few inputs. They are also known for being 'hardy', or being able to handle a free range environment with greater stress. Production is constrained by overall farm size, open space and availability of farm/household food byproducts. Chicken used for industrial production are fast growing under a diet of concentrate feed, and can be grown in small spaces. They require more health inputs and a protected environment; they do not adapt as well to environmental stress. The main constraints to their use are the need for production infrastructure (cages, protective buildings) and credit for the purchase of concentrate feed.

For the reasons given above, poorer farm households tend to specialize in local chicken, while larger, wealthier farmers tend to specialize in industrial chicken. Crossbred chicken are almost exactly 'in between' local and industrial chicken at all levels, especially in terms of input requirements and prices. Thus, for discussion purposes, we will refer largely to industrial and local chicken except when specifically discussing the emerging role of crossbred chicken. The tables below will refer to production level quartiles: 1st quartile has the smallest annual production (number of batches*average batch size), while the 4th quartile has the largest production level. The table below shows the percent of each variety of chicken produced by different annual production levels, and contribution to total household income. The 1st quartile produces less than 150 head chicken per year, the 2nd quartile 150-300 head, the 3rd quartile 300-800 head, and the 4th quartile more than 800 head. Comparing the 1st and 4th quartile, it is easy to see that the largest farmers are wealthier, more specialized in raising chicken, and largely raise crossbred and industrial breeds; while the farmers with lower levels of production and poorer, less specialized, and mainly raise local breeds.

Table 2.1: Breeds used and contribution to income by quartile of annual production

Farm Production Level	Local	Crossbred	Industrial	% of HH Income from Poultry Production
1st Quartile	76%	20%	4%	16%
2nd Quartile	55%	38%	6%	20%
3rd Quartile	39%	50%	11%	23%
4th Quartile	8%	61%	28%	34%

Smaller farms are more likely to maintain their own breeding stock and buy chicks from local producers (Table 2.1). They are also more likely to sell chicks to other farms, largely farms in the same commune (Tables 2.3, 2.4). The majority of the commercial chick producers interviewed raise crossbred or industrial chicks; which indicates that farmers raising local chicken are limited

to sourcing chicks from local farms. Larger farms and those raising crossbred and industrial breeds are more likely to buy chicks over larger distances. For all types of farms, purchasing chicks from traders is rare. Smaller farms tend to buy chicks at an older age (averaging 18 days for local breeds); while for large farms 1 day is the norm for industrial, and about 3 days for crossbred chicks (Table 2.5). The age at which local chicks are bought and the reliance on local sources indicates that local chick production may also be constrained by availability of breeding stock. Some reasons for purchase of local chicks at an older age include: (1) local chicken have some desirable characteristics that can only be determined at an older age, (2) local chicken that reach a certain age are more likely to survive, (3) hatching of eggs for local chicks is more dispersed and hence more difficult to find, (4) farmers buying local chicks are more credit constrained and hence often buy at a later date, and (5) locating other farmers willing to sell local chicks is difficult.

Table 2.2: Source of chicks

Farm Production Level	Own Farm	Village Farms	Commune Farms	District Farms	Own Province Farms	Other Province Farms	Market	Trader
1st Quartile	38%	14%	6%	8%	2%	8%	19%	5%
2nd Quartile	33%	15%	14%	16%	7%	10%	3%	1%
3rd Quartile	22%	26%	10%	12%	10%	15%	2%	3%
4th Quartile	4%	11%	13%	12%	18%	33%	0%	9%

Table 2.3: Location of chick sales

Farm Production Level	Village	Com-mune	District	Province	Other Province	Market
1st Quartile	76%	12%	4%	0%	4%	4%
2nd Quartile	69%	16%	10%	0%	3%	2%
3rd Quartile	57%	21%	8%	4%	2%	8%
4th Quartile	32%	13%	9%	3%	18%	25%

Table 2.4: Percent of farms keeping hens and selling chicks

Farm Production Level	% of Farms Keeping Hens	% of Farms Selling Chicks
1st Quartile	56%	18%
2nd Quartile	54%	25%
3rd Quartile	53%	25%
4th Quartile	23%	10%

Table 2.5: Average age of chicks purchased (days)

Farm Production Level	Local	Cross	Industrial
1st Quartile	19.7	4.7	1.0
2nd Quartile	9.6	3.2	1.3
3rd Quartile	8.5	1.9	1.3
4th Quartile	3.4	1.3	1.1

The timing of rice harvests and availability/affordability of concentrate feed may play a large role in constraining backyard poultry production. Industrial chicken are largely fed concentrate feed, which can be stored more easily than byproducts but is much more expensive. Over half the industrial chicken producers sell more than 4 batches per year, while almost no producers of local and crossbred chicken sell more than 4 batches (Table 2.6). Many producers of local chicken are able to sell 3-4 times per year, while this is less likely for crossbred chicken producers. Crossbred chicken are fed a combination of concentrate feed and household byproducts; therefore production would most likely be constrained by harvest timings and byproduct availability as batch size tends to be larger. Households raising crossbred chicken might also face a liquidity/credit constraint if they are only able to purchase concentrate feed after harvests. Crossbred chicken producers may also be producing for periods when demand is higher.

Table 2.6: Number of batches by type of chicken produced[1]

Annual Number of Batches	Local Chicken Producers	Crossbred Chicken Producers	Industrial Chicken Producers
1-2 Batches	54%	71%	26%
3-4 Batches	42%	28%	25%
>4 Batches	5%	1%	49%
Observations	254	229	68

Table 2.7: Batch size by type of chicken produced

Batch Size	Local Chicken Producers	Crossbred Chicken Producers	Industrial Chicken Producers[2]
Average Batch Size	90	519	5,542
Median Batch Size	70	250	325
Observations	254	229	68

Farms report sales peaks in the early fall and winter, which indicates that sales are indeed following harvests, as the two rice harvests tend to fall in June and September/October. In many districts sales increased early fall, experience a month or two of lower sales and then increased again in the winter (Table 2.8). These patterns are not uniform across districts, which could either be due to different harvest timings or marketing specialization - different areas supply urban areas at different times. Generally, sales during spring and summer appear to be low, which would also coincide with low levels of feedstock and the feeding period for chicken directly after the rice harvest. Large farms appear not to be affected by seasonal demand or seasonal feed constraints. Most likely they are operating under contract for regular sales, while smaller

[1] About 12% of producers interviewed raise more than 1 type of chicken. For clarity, they are not included in these calculations.
[2] One industrial chicken farmer sells 300,000 birds per batch; the next largest producer sells 15,000 birds per batch.

farms increase sales according to seasonal demand and feed availability. Local traders also show peaks in sales in the early fall throughout the winter, with a glut in sales in the spring and summer, which follows patterns reported by farmers. Because local traders mainly deal in local chicken and crossbreds, their trade pattern would be more subject to the date of rice harvests.

Table 2.8: Farmers', traders' and Ha Noi vendors' % increase in average sales[3] by month

Agent	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Farmers	40	28	20	19	0	0	0	0	117	10	10	6
Traders	16	5	5	1	0	0	0	2	5	3	3	12
Vendors	52	21	2	0	0	0	0	2	1	2	7	6

Ha Noi market vendors however, report the most significant increases in sales in January and February, in contrast the increase sales in the fall for other market chain players. This could be caused by most extra chicken being produced in fall being unfinished stock.

Slaughterhouses appear to be responding to different supply and market conditions, with variable increases in sales similar to those of farmers and vendors (Table 2.9). The slaughterhouses largely serve Ha Noi, and largely appear not to be receiving the chicken from increasing sales in various districts in the fall.

Table 2.9: Slaughterhouses' % increase in average sales by month

Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
B.Th. Long	3	0	0	0	0	0	0	3	3	0	0	18
Ha Vi	15	39	2	0	0	0	7	2	1	0	6	3
Soc Son	0	60	0	0	0	0	0	0	0	0	0	0
Tu Liem	0	0	0	0	0	0	0	0	0	0	0	0

Production Decisions and Constraints

Returns to local chicken are the highest, calculated by Otte (2006) to be up to 600%. This is largely due to the fact that local chicken require very few inputs and can utilize byproducts. Returns to industrial breeds are much lower, given that feed inputs are required and prices are much lower. However, turnover of industrial breeds is higher because they grow much quicker and hence farmers experience more production cycles per year. More income per farm could be generated by raising industrial chicken for this reason, although margins are lower. Initial involvement in production of crossbred chicken would require a small investment in infrastructure; while industrial chicken would require a larger infrastructure investment. Based on the discussion above, one might conclude that credit/wealth and feedstock are the main

[3] This is only for farmers reporting an increase in their sales, thus only represents an average for those reporting.

production constraints, which is why choice of breed for production would be based on wealth. This supports the idea that local chicken production is 'naturally' pro-poor.

When making production decisions, farmers must consider capital, labor, credit/liquidity, and farm/household byproduct availability. Labor is not a constraint for local chicken production, but it might be for larger farms producing industrial chicken. Credit availability mainly affects producers of crossbred and industrial chicken. Farms that are constrained by capital and credit might choose to raise local chicken. Farms that are not constrained by these things would choose to raise industrial chicken. Another constraint would be the availability of chicks; whether from one's own farm or other farms. Given the existence of commercial producers of crossbred and industrial chicks, this is most likely a constraint for local chicken farmers. Prices would also factor into farm production decisions, however farmer survey data indicates that on average scale does not have a large impact on farm gate chicken prices.

In modeling the production decision, we assume capital and labor to be set (previously determined), so that the farmer already knows which variety would be produced. We model the case of crossbred chicken, which is the most interesting because feedstock/byproducts and credit might both be binding. The fixed factors that potentially bind production are the level of capital investment ($\bar{k}$), household labor ($\bar{L}$) and household byproduct ($\bar{S}$). $Q(\bar{k})$ is the maximum amount of birds that can be produced given $\bar{k}$. Household labor also could constrain production, where the labor requirement might be denoted as $l(n)$. Labor is assumed to be surplus household labor; additional labor costs for larger farmers could also be taken in account with a using a cost function $x(n)$, but for this model labor is considered to be non-binding for all feasible levels of production. It is assumed that households use all of their available byproduct $\bar{S}$ to feed chicken. The main purchased input into production is concentrate feed, which is denoted by E, and costs $c(\beta, E)$. β is a concentrate feed price index that is unique to each farmer and takes into account both seasonal availability/pricing of feed and credit constraints. Farmers produce n birds, which cost x per bird, which would include items such as chick cost and vaccinations. The total kilograms of chicken produced is $f(\bar{S}, E, n)$, which are sold for a price of p. A production function and profit maximization problem could be set up as follows:

$$\text{Profit Maximization Problem: } \max_{E,n} \pi = pf(\bar{S}, E, n) - xn - c(E, \beta)$$

$$\text{Capital Constraint: } n \leq Q(\bar{k})$$

It is easy to see that farmers produce where the marginal revenue for increasing feed use is equal to the marginal cost of increasing feed use: $p\frac{\partial f(n,\bar{S},E)}{\partial E}=\frac{\partial c(E,\beta)}{\partial E}$ and where the marginal benefit of adding another chicken equals the marginal cost of adding another chicken: $p\frac{\partial f(n,\bar{S},E)}{\partial n}=x$. For these conditions to hold, we need the second order condition of: $p\left[f_{nn}(pf_{EE}-c_{EE})-pf_{En}^2\right]<0$. We initially assume that capital is not a binding constraint, otherwise production would be $n=Q(\bar{k})$ with the following condition: $p\frac{\partial f(Q(\bar{k}),\bar{S},E)}{\partial E}=\frac{\partial c(E,\beta)}{\partial E}$, which holds given $pf_{EE}-c_{EE}<0$. A less general profit function with the same properties and results would be: $\underset{E,n}{\text{Max}}\pi=png(\frac{1}{n}(\gamma\bar{S}+E))-xn-\beta c(E)$, where γ parameterizes the feed value of byproduct relative to concentrate and the production function is $f=ng(\frac{1}{n}(\gamma\bar{S}+E))$. We begin with using the more general form to clearly show to the results for changes in parameters. By making the following assumptions for the general model, we can calculate the impact of changes to $\bar{S}$ and β on production levels.

Increasing Marginal Product: $f_E, f_{\bar{s}}, f_n > 0$
Decreasing Marginal Returns to Feed: $f_{EE}, f_{\bar{S}\bar{S}} < 0$
Increasing Marginal Returns: $f_{En}, f_{\bar{S}n} > 0$
Decreasing Marginal Returns to Additional Chicken: $f_{nn} < 0$
Substitutability of Feed & Byproduct at Optimal Production Level: $f_{E\bar{S}}(E^*,n^*,\bar{S})<0$
Increasing Marginal Outlay: $c_E, c_\beta, c_{E\beta} > 0$
Economies of Scale: $c_{EE} \le 0$

We now consider the impact of changes to β and $\bar{S}$ on levels of concentrate feed inputs, E. Taking the comparative statistics gives us the following results, assuming capital and labor constraints are not binding. Substitutability

$$\frac{dE}{d\beta}=\frac{-c_{E\beta}f_{nn}}{\left[f_{nn}(pf_{EE}-c_{EE})-pf_{EN}^2\right]}<0$$

$$\frac{dE}{d\bar{S}}=\frac{p\left[f_{E\bar{S}}f_{nn}-f_{En}f_{n\bar{S}}\right]}{\left[f_{nn}(pf_{EE}-c_{EE})-pf_{En}^2\right]}\ \pm,\ \text{depending on } f$$

$$\frac{dn}{d\beta} = \frac{f_{En}c_{E\beta}}{\left[f_{nn}(pf_{EE} - c_{EE}) - pf_{EN}^2 \right]} > 0$$

$$\frac{dn}{d\bar{S}} = \frac{\left[f_{n\bar{S}}(pf_{EE} - c_{EE}) - pf_{En}f_{E\bar{S}} \right]}{\left[f_{nn}(pf_{EE} - c_{EE}) - pf_{EN}^2 \right]} \pm, \text{ depending on } f$$

Given our assumptions listed above, the impact of an increase in β as expected will decrease concentrate feed use and increase the number of chicken produced. As a variable input, increasing the number of chicken substitutes for decreasing concentrate feed use when the feed cost index increases. The impact of changes to household feedstock is less clear, and depends on second order impacts of the interaction between feed sources and number of chicken. Using the less general production function shown above, $f = ng(\frac{1}{n}(\gamma\bar{S} + E))$, gives a more definite result.

$$\frac{dE}{d\bar{S}} = \frac{p\left[f_{E\bar{S}}f_{nn} - f_{En}f_{n\bar{S}} \right]}{\left[f_{nn}(pf_{EE} - c_{EE}) - pf_{En}^2 \right]} = \frac{(\frac{\gamma}{n}g'')(\frac{(\gamma\bar{S} + E)^2}{n^3}g'') - (\frac{-(\gamma\bar{S} + E)}{n^2}g'')(\frac{-\gamma(\gamma\bar{S} + E)}{n^2}g'')}{\left[f_{nn}(pf_{EE} - c_{EE}) - pf_{En}^2 \right]} = 0$$

$$\frac{dn}{d\bar{S}} = \frac{\left[f_{n\bar{S}}(pf_{EE} - c_{EE}) - pf_{En}f_{E\bar{S}} \right]}{\left[f_{nn}(pf_{EE} - c_{EE}) - pf_{EN}^2 \right]} = \frac{\left[(\frac{-\gamma(\gamma\bar{S} + E)}{n^2}g'')(p\frac{1}{n}g'' - c'') - p(\frac{-(\gamma\bar{S} + E)}{n^2}g'')(\frac{\gamma}{n}g'') \right]}{\left[f_{nn}(pf_{EE} - c_{EE}) - pf_{EN}^2 \right]} =$$

$$\frac{(\frac{-(\gamma\bar{S} + E)}{n^2}g'')\left[\gamma(p\frac{1}{n}g'' - c'') - p(\frac{\gamma}{n}g'') \right]}{\left[f_{nn}(pf_{EE} - c_{EE}) - pf_{EN}^2 \right]} = \frac{(\frac{-(\gamma\bar{S} + E)}{n^2}g'')\left[-\gamma c'' \right]}{\left[f_{nn}(pf_{EE} - c_{EE}) - pf_{EN}^2 \right]} > 0$$

Using the simpler profit function tells us that concentrate feed use stays the same when the amount of household surplus increases, but that in turn the number of chicken raised will increase. This conclusion rests on the assumption of economics of scale in feed purchase, which is realistic and in the simplest case we would expect that producers face linear costs where $c'' = 0$. If a farmer could not receive bulk discounts for feed (economics of scale), he would not increase the number of chicken when his byproduct supply increases. We now consider the case where the number of chicken produced is constrained by the level of capital, look at the impact of an increase in capital on concentrate feed use. We use the more general profit function and also consider changes in β and $\bar{S}$.

$$\frac{dE}{d\bar{k}} = \frac{-pf_{En}Q'(k)}{pf_{EE} - c_{EE}} > 0$$
$$\frac{dE}{d\bar{S}} = \frac{-pf_{E\bar{S}}}{pf_{EE} - c_{EE}} < 0$$
$$\frac{dE}{d\beta} = \frac{c_{E\beta}}{pf_{EE} - c_{EE}} < 0$$

This gives us the expected result that an increase in capital will increase the use of concentrate feed. As before, an increase in the feed cost index decreases feed use. When production is constrained by capital, we also see that an increase in byproduct availability will decrease concentrate feed use. Because farmers cannot increase the number of chicken, they substitute concentrate with byproduct. The profit maximization problem could be made more dynamic by making $\bar{S}$ not set but also potentially a source of feed for other livestock. Similarly, a problem could be set up where a farmer considers potential investment in k, which would take into account anticipated future cash flows and impact the choice of variety. Adding a labor constraint for large farms would not significantly change the findings.

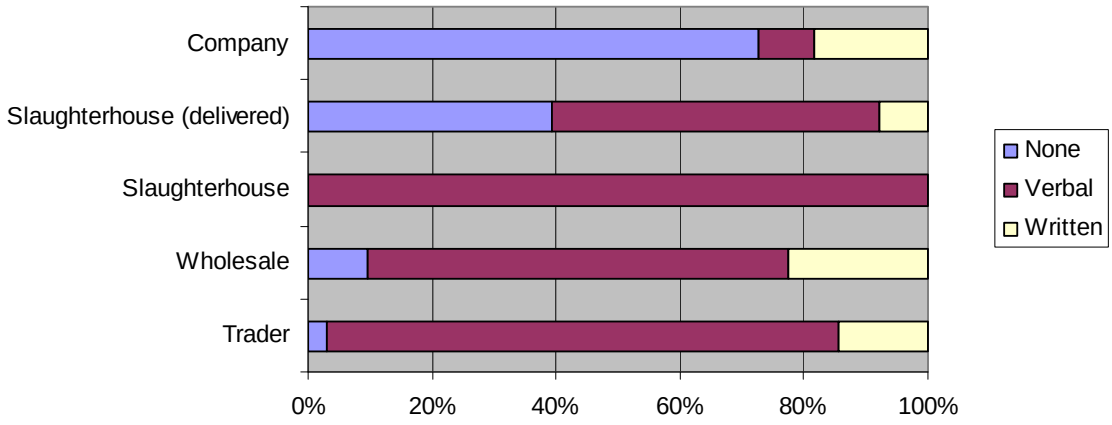
3. Contracting and Poultry Supply Chains

At all levels of the supply chain, informal contracts dominate agreements to purchase poultry (see Figure 3.1). Instead of operating as a commodity market with perfect competition where all producers and buyers can freely enter/leave markets, poultry producers and intermediaries have locked-in informal relationships with their trading partners. This also indicates that producers rarely initiate production without a certain buyer. If poultry markets were perfectly competitive, farmers could freely sell into the markets at 'market clearing' prices. Alternatively, if the supply side risk were lower, producers could wait until prices were observed when birds reach market weight to make a decision whom to sell to. More research is necessary to better understand the nature of these informal contracts, but it is clear that supply chain players are linked through verbal agreements and that these agreements are a critical part of the functioning of supply chains.

The fact that most producers rely almost entirely on informal agreements, while eschewing formal contracts, indicates that levels of trust are not only high amongst supply chain players, but that also locked-in trading partners are necessary in the current market environment. Chicken have fairly short production cycles compared to other livestock, so producers and traders would have regular interaction. Hence producers and traders are playing a 'repeated game', where if one player defects (i.e. doesn't deliver the agreed product), s/he can be excluded from future interactions or otherwise 'punished'. Poultry trade in northern Viet Nam, especially trade of local

breeds amongst small players, is thus governed by a series of high-trust informal relationships that are essential for market participation. Larger players are better able to adopt formal contractual relationships.

Figure 3.1: Contractual relationships with poultry suppliers



Amongst commercial chick producers in several districts, formal relationships were more likely to occur with larger farms and traders, but verbal contracts were the norm. In the farmer survey, verbal contracts dominated agreements for purchases except for with end users, who farmers had no agreements with. Wholesale traders working exclusively with companies (CP, etc.) had formal agreements for the purchase of chicken. Agreements with farms tended to be verbal except at one smaller wholesale market where traders had no contractual agreement with on average close to half of the farmers they purchased chicken from. Wholesale traders also tended to have verbal agreements with other traders. Overall wholesale traders tended to have more varied relationships with their customers, although the majority relied on verbal agreements. Slaughterhouses tended to have verbal agreements with traders, but formal agreements with companies. Verbal agreements were the norm with slaughterhouse customers, although those operating in one market relied heavily on formal agreements with shops. Ha Noi market vendors had verbal agreements with many of their suppliers, although those purchasing from companies or slaughterhouses that delivered birds to them often had no contracts.

Contractual agreements for regular purchase might include arrangements for quantity, price, timing of purchase, or specific product characteristics. If farmers are contracting on product characteristics, our survey work indicates that they are not being rewarded for it. Farmers generally do not receive a premium for any type of safety, special breeds, or any quality characteristics. Future research on contractual relations could highlight many of the constraints facing producers and intermediaries, as well as the type of information failure and transaction costs that these contracts are intended to mitigate. In the economic literature, there are not many articles that set up a theoretical framework for how information failure or transaction costs

can restrict the involvement of smaller farms in certain supply chains. Studies have shown that trust plays an important role in industrial supply chains in developing countries, (Handfield and Bechtel, 2002). Another study showed that transaction costs played a large role in determining the nature of cattle vertical (supply chain) coordination in the UK (Hobbs, 97). Certainly the role of trust must be even greater in supply chains in a more constrained environment. Future farm-level and supply chain research should include more detailed questions on the nature of contracts.

4. Transportation and Scale Constraints

Transportation and scale constraints play a large role in determining price and availability of chicken in urban areas. Traders face a trade-off between economics of scale/aggregation and delivering the preferred local varieties. Crossbred chicken are raised by all types of farmers. Table 4.1 shows how smaller farms are more likely to sell into local markets, directly to end users. These randomly selected small commercial farmers (2nd and 3rd quartiles) were more likely to deal with commune traders; who in turn largely operate from motorbikes or even bicycles (Table 4.2). Reaching more distant and lucrative urban markets is more likely if there are economics of scale related to transportation and aggregation. In the Ha Vi wholesale market, the largest wholesale market in northern Viet Nam, several large traders utilized trucks to deliver birds to slaughterhouses or other traders, based on the daily number of birds traded.

Table 4.1: Crossbred chicken customers by farm production level

Annual Farm Production Level	Commune Traders	District Traders	Own Province Traders	Other Province Traders	Commune Level End Users	Other
1st Quartile	16%	11%	22%	7%	33%	11%
2nd Quartile	21%	26%	17%	2%	26%	8%
3rd Quartile	31%	27%	19%	7%	13%	3%
4th Quartile	14%	43%	32%	5%	3%	4%

Table 4.2: Commune trader method of chicken collection

District	Motorcycle	Bicycle	Other
Gia Binh	37%	63%	0%
Tien Du	100%	0%	0%
Ly Nhan	100%	0%	0%
Kim Bang	50%	50%	0%
Soc Son	54%	44%	3%
Tu Liem	90%	10%	0%
Hoai Duc	56%	44%	0%
Phu Xuyen	89%	11%	0%

Aggregation of different varieties is also a likely significant transportation constraint. To come to a certain area, a truck must be able to pick up enough market-ready birds in a specific area or route. For enough local chicken that are market ready to fill a truck, a larger geographical area would have to covered, due the biological requirements of raising local varieties. Similarly, aggregating from several small farms with any breed would add to the costs of utilizing a truck or larger vehicle. Traders generally deliver birds early morning (1am to 6am) to wholesale markets; these birds are slaughtered immediately and then sold in Ha Noi that day. Gathering birds from farms in concentrated areas and larger farms will allow traders to meet these daily time constraints.

An epidemiological study (Soares Magalhaes *et al*., 2007) indicated that many of the traders serving Ha Noi wholesale and larger retail markets sourced from larger farms. About 80 percent of farms supplying poultry (duck, muscovy and chicken) to these traders had farms with more than 200 head of poultry. Almost 2/3 of the farm suppliers (63%) had more than 500 head of poultry. Given that household consumption of local chicken is still much higher than that of industrial chicken (see Section 7 on demand) and the larger wholesale market tends to receive more crossbred and industrial chicken (see Table 4.3), local chicken appear to be coming into Ha Noi through less formal channels that do not operate on the scale of wholesale markets. Bac Thang Long is a smaller scale wholesale market than Ha Vi. Section 6 will further discuss informality in urban poultry markets.

Table 4.3: Chicken varieties traded by wholesale market traders

Market	Local	Crossbred	Industrial	'Egypt'
Bac Thang Long	55%	5%	30%	10%
Ha Vi "entering"	26%	24%	47%	3%
Ha Vi "middlemen"	13%	44%	43%	0%

A model of the role of transportation and scale constraints in supply chains

We draw on the literature on labor contracts to model the contracts in supply chains in the market for chicken in Viet Nam. The data doesn't contain information on the precise contractual arrangements between farmers and buyers. Thus we setup a simple model and consider the implications of different structures of the relation between farmers, traders and end users. Then we show how the implications of the model could be tested with the data.

We consider a model in which each farmer is matched with a single buyer. We do not model the process in which a farmer decides exchange with a specific buyer and take this as given. So a farmer has the choice between selling to the trader it is matched to or to a 'local market'. The price of a chicken in the 'local market' is p. Farmers are different with respect to the size of their farm that we take equal to the number of chicken N they can raise. Let the price at which

the farmer sells a chicken to the buyer be q and the number of chicken that the buyer buys from the farmer be S. Assuming that the farmer can sell all the $N-S$ chicken in the 'local market', the utility of the farmer is

$$U(qS + p(N-S))$$

Introducing uncertainty in the sale of chicken in the 'local market' does not change the results.

All traders are risk neutral but have different abilities to sell their chicken and get higher prices: better transportation facility (truck instead of bike or motorcycle), better commercial network and contracts with final users, better access to large markets etc. The ability of a trader is parameterized by θ, where higher values of θ stand for high ability. When a trader buys S chicken at price q his payoff is:

$$R(S,\theta) - qS$$

where $R(S,\theta)$ is the revenue function: $R_s > 0$, $R_{ss} < 0$ and $R_{S\theta} > 0$. In other words, for traders, there is decreasing marginal return of chicken stock and more able traders have higher marginal returns of chicken stock. The assumption of decreasing marginal return of chicken stock captures losses during transportation for example or the fact that it is more difficult to sell a lot of birds.

How are the price per chicken q and the volume of exchange S determined? Since we do not observe the exact structure of the commercial relationship between traders and farmers, our strategy is to consider two ways in which they could be trading and derive the implications of such structures.

The simplest interesting case is that in which the farmer unilaterally chooses the price q. The trader then determines the level of exchange S. In this situation, the trader's optimal number of chicken to buy solves $R_s = q$. The best price that the farmer can set is obtained by maximizing $U(qS + p(N-S))$ with respect to q and S, subject to the trader's reaction function given by $R_s = q$. An interior solution requires that $q \geq p$ and is given by the first order conditions:

$$\begin{aligned} (1)\ & LU' && = \lambda \\ (2)\ & (q-p)U' && = -\lambda R_{SS} \\ (3)\ & R_S && = q \end{aligned}$$

where λ is the Lagrangian multiplier of the trader's reaction function. Dividing relation (2) by relation (1) and using equality (3), we get:

$$(4)\ 1-\frac{p}{q}=-\frac{SR_{SS}(S,\theta)}{R_S(S,\theta)}=\eta(S,\theta)$$

where $\eta(S,\theta)$ is the price elasticity of the trader's demand for chicken. Equation (4) leads us to the first set of implications

Proposition 1

Conditional on a trader's demand for chicken S

1. Farmers matched with more able traders will receive higher prices if those trader's have a more elastic demand for chicken, i.e. $sgn(\frac{\partial q}{\partial \theta})=sgn(\frac{\partial \eta}{\partial \theta})$
2. Prices do not depend on farm size

Proof : The implications follow from straightforward differentiation of (4).

Scenario 1 leads to a low inefficient level of trade between the two parties. In Scenario 2, we consider an efficient level of exchange between the trader and the farmer. We assume that both the price of a chicken q and the volume of trade S are chosen through a bargaining process. We now employ Nash's equilibrium concept.

The farmer's payoff when the negotiation succeeds is $U(qS+p(N-S))$, while if the bargaining fails, he can sell all his chicken in the 'local market' and reach a utility $U(pN)$. We set the trader's payoff when the bargaining fails to zero. Then the optimal price and trade volume solve:

$$\max_{q,S}\left[U(qS+p(N-S))-U(pN)\right]\left[R(S,\theta)-qS\right]$$

The solutions are given by the following first order conditions:

$$(5)\ \frac{U'(qS+p(N-S))}{U(qS+p(N-S)-U(pN)}=\frac{1}{R(S,\theta)-qS}$$

$$(6)\ \frac{(q-p)U'(qS+p(N-S)}{U(qS+p(N-S)-U(pN)}=\frac{q-R'(S,\theta)}{R(S,\theta)-qS}$$

Proposition 2:

Conditional on trader's demand for chicken S:

1. Farmers matched with more able traders will receive higher prices.

2. Farmer's with higher installed capacity (larger farm size) will receive higher prices per chick.

Proof: The implications follow from straightforward differentiation of (5). Using (5) and (6) one can show that this scenario leads to higher volumes of trade between the two parties.

Possible extensions

This simple model does not deal with issues related to the choice of variety nor does it study the determinants of farmer's choice of capacity N. We limited ourselves to studying how different exchange structures between farmers and traders affected the price of the transaction. The same implications given in Proposition 1 and 2 could be derived for the volume of trade, namely that conditional on prices, bigger farms and those matched with more able traders will sell more animals to traders. However we think that the implications in terms of prices are more interesting and more relevant for a study that examines how supply chains affect the welfare of smallholders.

Econometric test

In this section we examine empirically how the characteristics of supply chains affect the welfare of smallholders. More specifically we look at whether farmers who work with traders that have access to bigger and better markets receive higher prices and how much more. Put differently, we want to get a measure of the value of more effective and integrated supply chains in the poultry market in Viet Nam.

Define p_{iv} as the logarithm of the per chicken price received by farmer i who raises variety v. Let T_{iv} be the vector of characteristics of the trader with whom the farmer is exchanging: district/commune trader, trader has a bike etc. Let also X_{iv} be the vector of characteristics of the farmer: farm size, age, experience as a farmer etc. The basic regression is the following:

$$p_{iv} = \alpha_0 + \alpha_{1'} T_{iv} + \alpha_{2'} X_{iv} + \beta S_{iv} + \nu_v + \grave{o}_{iv}$$

where S_{iv} is the number of chicken sold by the trader; ν_v is a variety and district fixed effects. We control for S_{iv} because all the implications of the theory are conditional on the number of chicken sold. The coefficients of interest in this regression are α_1 and α_2, which tell us how trader and farm characteristics affect prices.

Unobserved farmer characteristics might be correlated with the type of trader with whom he is working with; T_{iv} might be endogenous. So α_1 will only support/reject the theory in the sense that it tells us how trader characteristics are associated with prices. One could argue, for example, that farmer experience could be excluded from the controls X_{iv} to be used as an instrument for T_{iv}. The story is that farmers who have been in business for a long time get higher prices because it gives them time to find more able traders. However we should start with correlations and maybe argue later, if we find no good instrument, that T_{iv} is exogenous conditional on X_{iv}.

Table 4.4: Regression results for (log) price per chicken

	Model (1)		Model (2)		Model (3)	
Independent Variable	**Coeff.**	***t***	**Coeff.**	***t***	**Coeff.**	***t***
% Sold to Commune Traders	-0.0024	5.95***	-0.0011	3.93***	-0.0011	3.90***
% Sold to District Traders	-0.0030	8.83***	-0.0010	4.29***	-0.0009	3.81***
% Sold to Province Traders	-0.0047	12.80***	-0.0017	6.27***	-0.0015	5.63***
% Sold to Other Province Traders	-0.0049	8.57***	-0.0007	1.69*	-0.0005	-1.10
% Sold to Commune Markets	0.0003	-0.26	-0.0007	-0.91	-0.0007	-1.05
% Sold to District Markets	0.0004	-0.16	-0.0007	-0.38	-0.0009	-0.49
% Sold to Ha Noi End Users	-0.0017	-1.14	-0.0012	-1.21	-0.0012	-1.17
% Sold to Wholesale Markets	-0.0064	2.19**	-0.0038	1.95*	-0.0037	1.90*
% Sold to Slaughterhouse	-0.0052	2.53**	-0.0006	-0.43	-0.0004	-0.28
% Sold to Others	-0.0026	3.59***	-0.0012	2.43**	-0.0011	2.20**
Observations	689		689		689	
R-squared	0.24		0.06		0.09	
F test: No Trader Effect	15.75		3.55		3.33	
Prob>F	0		0.01		0.02	
F test: No End User Type Effect	2.26		0.52		0.47	
Prob>F	0.05		0.76		0.80	
Fixed Effects	**No**		**Yes**		**Yes**	
Controls	**No**		**No**		**Yes**	

* Significant at 10%; ** significant at 5%; *** significant at 1%

5. Heterogenous Regulation

Regular inspection and effective regulation of poultry trading systems is critical for maintaining poultry health and controlling avian flu. Regulating a trading system that is ruled by informal linkages where players are small-scale is an additional challenge in addressing disease threats. Most chickens traded in northern Viet Nam are transported by motorbike or bike all or part of the way to the retail market, although trucks are also used by traders serving the largest wholesale markets. Detailed data on timing and fees for inspection indicates wide variation in both by location. The tables below (5.1 to 5.4) highlight inspection timing and costs across several players in the poultry supply chain.

For commercial chick producers, the frequency (and cost) of safety inspection varies greatly by district (Table 5.1). In the farmer survey, only a negligible number of farmers reported paying for farm safety inspection, although inspection does appear to happen for most farms a few times a year. There are more inspections of large farms, with the lowest inspection levels occurring in districts where small commercial producers were interviewed. Large farms in this respect receive more attention from veterinary authorities. The level of inspection of local traders, who mainly cater directly to consumers, varies widely by district (see Table 5.1). Overall, only 37 percent of local traders receive some type of safety inspection.

Table 5.1: Farm safety and commune trader inspections per year

District	Farm Inspections		Traders inspected
	Mean	SD.	%
Gia Binh	3.2	1.5	83
Tien Du	3.1	1.1	14
Ly Nhan	3.5	2.0	0
Kim Bang	3.0	1.9	0
Soc Son	5.1	3.9	82
Tu Liem	5.3	5.1	0
Hoai Duc	3.3	1.3	14
Phu Xuyen	5.6	4.1	40
Chuong Mi	4.9	2.0	-
Dong Anh	4.8	1.9	-
Yen Phong	8.4	7.9	-

72% of traders operating in wholesale markets indicated that they paid for safety inspection for the birds they were trading, largely from district veterinary staff, but in some cases also from commune veterinary staff. The cost of certification, either per trip or when calculated per bird, varies widely (see Table 5.2). For 2/3 of the traders, cost per bird is less than 100 VND. For the other 1/3 of traders, cost per bird averages 430 VND. .

Table 5.2: Wholesale safety certification cost (VND/Trip)

District	Average	SD.	Min	Max	Obs.
Bac Thang Long	18,263	26,905	2,000	120,000	19
Ha Vi 'entering'	36,346	53,534	2,000	200,000	26
Ha Vi 'middlemen'	44,688	58,371	5,000	200,000	16
Tien Du	17,500	10,607	10,000	25,000	2

The cost of inspection for slaughtered birds is relatively low, but the procedure appears to vary considerably by location (Table 5.3).

Table 5.3: Cost of inspection of slaughtered birds

District	On Site: Per Bird	On Site: Per Trip	Off Site: Per Bird	Off Site: Per Trip
Bac Thang Long		17,625		16,000
Ha Vi	428	7,478	35	1,948
Soc Son	500	-	-	-
Tu Liem	70	-	-	3,000

Once birds reach the market, safety inspection is indicated either by stamp or certificate or both. The requirements for these are not consistent across urban markets, as indicated in Table 26

Table 5.4: Percent of market vendors indicating specific safety requirements

Safety Requirement	Percent
Stamp & Certificate	43
Only Certificate	35
Only Stamp	19
No Regular Inspection	3

The difficulties related to consistent regional coordination on regulation strengthens the case for market-driven approaches to controlling avian flu, as well as systems that allow for traceability of birds to the farm of origin. Birds lose their 'identity' not only once they leave the farm, but also after the trader sells to slaughterhouses. This happens despite multiple levels of inspection in many cases. It is likely that most birds that enter urban markets have undergone at least 2 and maybe 3 separate visual inspections while the farm origin is obscured.

Optimal regulation would allow for discovery of sick birds early in the marketing process. Another key element of regulation is to charge fines that are high enough that farmers and traders will report or otherwise not trade sick birds. However if fines are too high then incentives to hide birds or otherwise avoid formal channels of trade will increase. Incentives through increased market access, higher prices and 'fine avoidance' would increase participation in formal marketing channels. Consistent regulation would allow for risk to be managed more predictably. Conducting regulation of poultry trade in a manner that is trusted by and can be communicated to consumers is also important, as will be discussed in Section 7.

6. Fragmented Poultry Production and Marketing

The poultry sector in Viet Nam is separating into a more formal sector that caters to urban areas and a smaller, more informal sector where chicken are raised and consumed within a relatively small geographical area and which operates through less formal marketing channels. Specialization is occurring based on production scale and chicken variety produced; and while having an important role, smallholders may not benefit from this fragmentation. This trend is

influenced by the previously discussed challenges that producers face: production constraints, heterogeneous regulation, scale and transportation constraints, and informal contracting. The poultry sector has also experienced upheavals due to HPAI epidemics; although not discussed in depth in this paper, other reports detail national, regional and farm level impacts that occurred immediately after outbreaks. The events clearly have influenced the poultry sector structure.

Larger farms raise industrial breeds (or crossbreds) and sell to urban consumers through larger markets and players, with greater integration into government regulatory systems. Larger farms tend to operate through the existing wholesale markets or large retail markets in Ha Noi's outer districts which are more regulated; while some 'companies' (CP, Phuc Thin, etc.) are selling directly to urban market vendors. Larger farms generally are also more able to sell to further distances and urban areas, as indicated by the higher percentages of large farms selling to traders operating over larger distances (see Tables 6.1 and 6.2). These trends hold when the same varieties are compared across different size producers, although for industrial chicken producers it is more difficult to draw conclusions due to the low sample size.

Table 6.1: Local chicken customers by farm production level

Annual Farm Production Level	Commune Traders	District Traders	Own Province Traders	Other Province Traders	Commune Level End Users	Other
1st Quartile	17%	10%	7%	1%	59%	6%
2nd Quartile	11%	31%	8%	0%	36%	13%
3rd Quartile	14%	39%	8%	3%	31%	4%
4th Quartile	25%	44%	13%	7%	10%	0%

Table 6.2: Industrial chicken customers by farm production level

Annual Farm Production Level	Commune Traders	District Traders	Own Province Traders	Other Province Traders	Commune Level End Users	Other
1st Quartile	0%	0%	61%	1%	38%	0%
2nd Quartile	3%	34%	42%	7%	15%	0%
3rd Quartile	2%	31%	40%	17%	5%	5%
4th Quartile	2%	41%	27%	25%	1%	4%

Larger farms also report that they are able to utilize more of existing production capacity (see Table 6.3), which is likely due to more market integration with urban areas. Birds sold from the larger quartiles of producers also are more likely to be at full market weight, indicating that these farms have less difficulty selling at optimal market weight (Table 6.3). Large farms furthermore sell more batches per year (Table 6.4), supporting that these farms are better able to negotiate regular sales with traders and that they are able to overcome production constraints. Smallholders sell local varieties, to traders who tend to work through smaller markets that are likely to cover shorter distances. Small farmers are also much more likely to sell to local end users. Relationships with end users tend to be without contract, while formal contracts are

common in Chuong Mi district, where only large farmers were interviewed. This indicates that in the current market environment larger entities are more likely to have formalized, legal supply chain relationships, while when birds from smallholders do enter urban areas, they are more likely to come through unregulated channels.

Table 6.3: Farmer survey: % of capacity used during survey period

Farm Production Level	Capacity Use		Chicken sold at Market Weight	
	Mean	SD.	Mean	SD.
1st Quartile	56%	26%	74%	19%
2nd Quartile	54%	24%	82%	13%
3rd Quartile	54%	25%	84%	12%
4th Quartile	62%	25%	89%	10%

Table 6.4: Number and size of batches sold per year

Farm Production Level	Ave. Nr. of Batches	Ave. Batch Size
1st Quartile	2.1	46
2nd Quartile	2.5	98
3rd Quartile	3.0	191
4th Quartile	4.5	3,048

Commercial chick producers in several districts report specialization in crossbred and industrial chicken; which supports that farmers source local chicken from other farmers (Table 6.5).

Table 6.5: Chicken varieties produced by commercial chick farmers

District	Local	Crossbred	Industrial	'Egypt'[4]
Soc Son	0%	100%	0%	0%
Tu Liem	0%	100%	0%	0%
Hoai Duc	0%	79%	21%	0%
Phu Xuyen	1%	77%	8%	14%
Dong Anh	10%	60%	30%	0%
Yen Phong	17%	42%	17%	25%

Chick producers in these districts tend to specialize in areas sold to; some operate locally while others have a large portion of their market outside of their own district or in other provinces (Table 6.6).

[4] 'Egypt' chicken is a relatively new variety that might be compared to crossbred or industrial chicken.

Table 6.6: Location of client farms for commercial chick producers

District	Commune	District	Own Province	Neighboring Province	Other Province
Soc Son	100%	0%	0%	0%	0%
Tu Liem	0%	0%	20%	0%	80%
Hoai Duc	57%	37%	4%	2%	0%
Phu Xuyen	3%	8%	39%	43%	6%
Dong Anh	0%	0%	30%	0%	70%
Yen Phong	18%	45%	0%	23%	13%

Chick producers also tend to specialize in the type of farm that they sell to (Table 6.7). In Phu Xuyen, there are many chick producers, and small to medium-sized farmers from other provinces will often travel there by motorbike to pick up chicks. In Soc Son, we see that the chick producers raise crossbred chicken for local small farms. In Tu Liem and Dong Anh, industrial and crossbred chicks are sold to farmers over long distances. Generally, the large distance over which some chick producers sell indicates markets for crossbred chicks are well developed.

Table 6.7: Size of client farms for commercial chick producers

District	Backyard: <50 head	Small: 50-200 head	Medium: 201-1,000 head	Large: >1,000 head	Don't know size
Soc Son	73%	28%	0%	0%	0%
Tu Liem	0%	20%	30%	50%	0%
Hoai Duc	0%	19%	68%	13%	0%
Phu Xuyen	26%	49%	15%	4%	5%
Dong Anh	5%	10%	35%	50%	0%
Yen Phong	0%	60%	10%	30%	0%

Several small poultry traders operate in rural areas in Viet Nam; sourcing from local farms and selling into local markets. Traders operating in farmer survey districts were interviewed. They are specializing in local chicken (Table 6.8) and mostly source chicken from smaller farms (Table 6.9). For almost all traders, virtually all customers were located within one district, and customers were individual consumers (usually more than 90%).

Table 6.8: Breeds traded by local traders

District	Local	Crossbred	Industrial
Gia Binh	83%	7%	10%
Tien Du	67%	0%	33%
Ly Nhan	0%	12%	88%
Kim Bang	81%	4%	15%
Soc Son	90%	4%	5%
Tu Liem	100%	0%	0%
Hoai Duc	47%	14%	39%
Phu Xuyen	70%	1%	29%

Table 6.9: Size of farm suppliers to local traders

District	Backyard: <50 head	Small: 50-200 head	Medium: 201-1,000 head	Large: >1,000 head	Traders or Market
Gia Binh	62%	25%	11%	2%	0%
Tien Du	26%	36%	29%	0%	10%
Ly Nhan	0%	28%	72%	0%	0%
Kim Bang	52%	38%	10%	0%	0%
Soc Son	67%	18%	15%	0%	0%
Tu Liem	100%	0%	0%	0%	0%
Hoai Duc	27%	20%	53%	0%	0%
Phu Xuyen	37%	17%	4%	0%	42%
Total	46%	25%	21%	0%	8%

Traders and slaughterhouses at Ha Vi market, the largest wholesale market, tend to specialize in crossbred and industrial varieties, while traders and slaughterhouses at Bac Thang Long market handle more local varieties. Bac Thang Long market is of much smaller scale, with all traders operating from motorbikes. The chicken breed as well as the average number of birds per trader per day varies considerably for each market. Table 6.10 shows the number of chicken traded per day for each the traders bringing birds into Bac Thang Long and Ha Vi markets. Traders with lower volume tend to trade the higher value local chicken, while larger traders are more likely to source crossbred and industrial birds.

Table 6.10: Type of birds traded by sales volume of traders delivering birds to Bac Thang Long and Ha Vi wholesale markets

Birds Traded Per Day	Local	Crossbred	Industrial	'Egypt'	Ave. Birds Traded
1st Quartile	61%	0%	33%	6%	81
2nd Quartile	31%	22%	39%	8%	150
3rd Quartile	17%	26%	50%	7%	305
4th Quartile	27%	28%	45%	0%	1,185

Slaughterhouse data supports the trend of market fragmentation (Tables 6.11 and 6.12). The large registered slaughterhouses in Soc Son and Tu Liem source almost entirely from companies; they also slaughter mostly crossbred and industrial. These large scale slaughterhouses are also more specialized, while the family operations in Bac Thang Long (BTL) and Ha Vi generally diversify with chicken and poultry. In Ha Vi, most slaughterhouses go the market to buy chicken; this is a larger market with traders who have higher volume so most birds are crossbred and industrial varieties. BTL slaughterhouses are supplied local chicken by the small-scale traders discussed above.

Table 6.11: Type of birds slaughtered and weekly volume

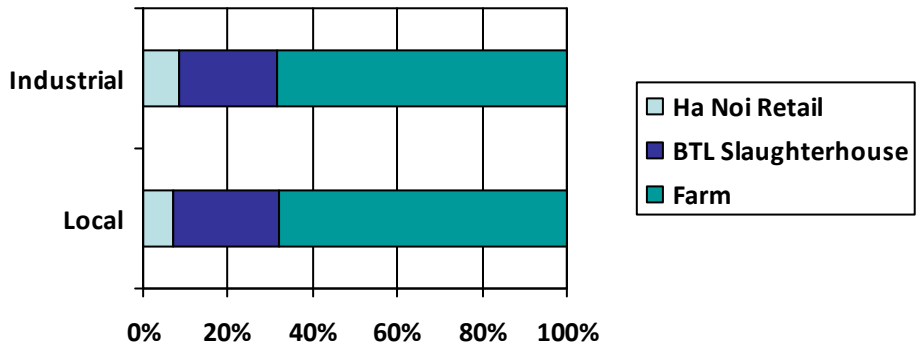
Slaughterhouse Location	Local	Crossbred	Industrial	Nr. of Chicken	Nr. other Poultry
Bac Thang Long	56%	14%	27%	881	836
Ha Vi	14%	37%	48%	148	103
Soc Son	20%	0%	80%	500	0
Tu Liem	20%	25%	55%	17,500	0

Table 6.12: Source of birds for slaughterhouses

Slaughterhouse Location	Farm	Market	Delivered by Trader	Company
Bac Thang Long	13%	0%	88%	0%
Ha Vi	3%	97%	0%	0%
Soc Son	0%	0%	20%	80%
Tu Liem	25%	0%	0%	75%

In urban markets, 40 percent of vendors sell only one variety, while over 2/3 (68%) of vendors have one variety account for 2/3 of their total sales. Despite the fragmentation of chicken markets, it does appear that chicken producers have some market power. Farmers on average receive about 2/3 of the urban retail value of the chicken (Figure 6.1). Urban market vendors receive less than 10% on average, and between the farm gate and slaughterhouses, a little more than 20% of the final value is added. Given that chicken often passes through several hands and often are transported by motorbike, there does not appear to be any market player asserting significant monopoly or market power.

Figure 6.1: Value-added for local and industrial chicken



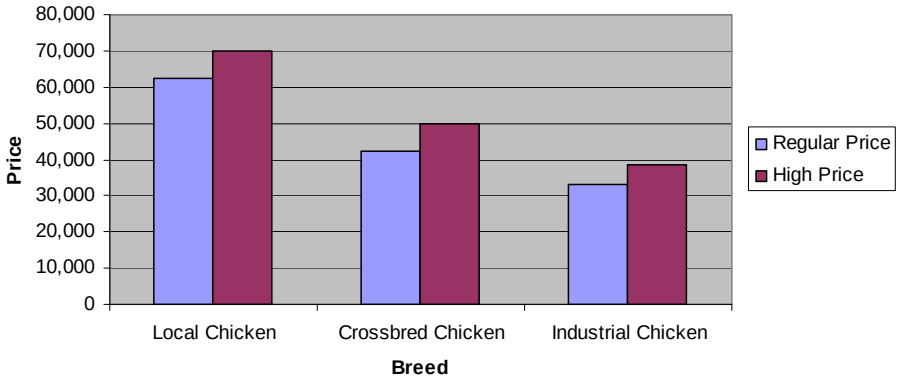
The production, transport and regulatory constraints discussed above are limiting the ability of small producers to sell to urban markets. From a general equilibrium perspective, the constraints on production of local chicken and market failure, combined with high demand, have led to the high prices currently observed in urban markets (see Section 7). These high prices could support the continuing informality of local chicken supply chains and vending, which includes illegal activity such as sale of live chicken in Ha Noi. Further strengthening of regulatory system

might exacerbate these issues unless smallholder participation is taken into account. Cooperatives and development of new methods of contract farming with smallholders may be ways to overcome market fragmentation. Further research and pilot project could elucidate ways to overcome these marketing problems.

7. Demand for Traditional Products and Safety in Urban Markets

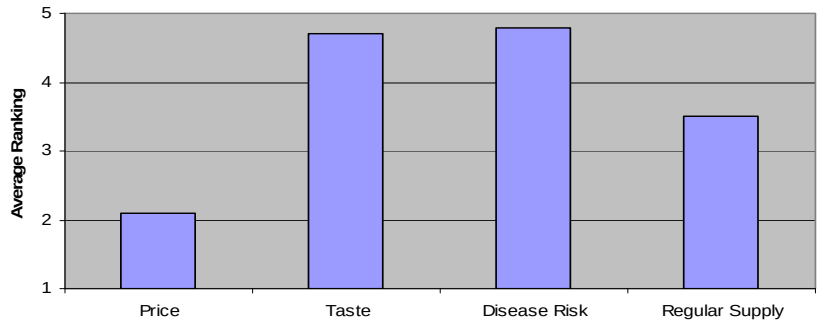
Consumers in Ha Noi still strongly prefer traditional poultry products. Despite the availability of cheap cage-raised varieties, slightly over half of all households consume only local varieties of free range chicken breeds. These local breeds command double the price of cage-raised or industrial varieties (see figure 7.1). Preferences for local birds are also indicated through ratings for concern taste, as only local varieties are considered to be 'tasty' (see Figure 7.2). This demand for local breeds has encourage the persistence informal, illegal live chicken markets[5] in Ha Noi: Thirty-five percent of local chicken consumers buy *only* live birds, while 37 percent buy *only* whole slaughtered birds. No consumers of industrial birds buy live birds, and they largely only buy chicken cuts. Live and whole slaughtered birds are more likely to be served in dishes where taste of the meat is more important and for more traditional uses while cuts are often used in dishes where the taste of meat is less important and in more convenient/quick preparations. Initial statistical analysis also indicates that industrial chicken is bought by (1) poorer families and (2) families with more children. This is paradoxical to the experience of many countries: more affluent consumers actually prefer a traditional product. Local breeds are sold more informally, for more traditional uses, and to wealthier consumers. Industrial breeds are sold in more formal venues, for poorer consumers, for consumers with special dietary needs, and for food uses that 'disguise' product quality. Relatively small consumption patterns for crossbred chicken are in line with these trends.

Figure 7.1: Ha Noi average chicken prices by breed



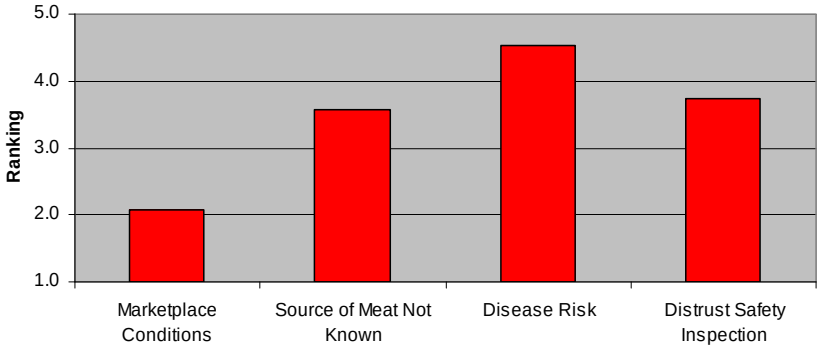
[5] Before the advent of avian flu, most chicken were sold live in Ha Noi markets. It is now illegal to sell live chicken in Ha Noi.

Figure 7.2: Ha Noi consumer quality concerns for chicken attributes



Consumers in Ha Noi are also aware of and highly concerned about safety risks (see Figure 7.3). Most think that the safety of the chicken they buy could be improved. The most important risks perceived by consumers are related to disease, animal origin and effectiveness of safety regulations. Initial statistical analysis has shown that households who have higher risk concerns related to chicken spend more food budget on non-chicken meat and on local, higher quality varieties. The higher spending on local chicken could be due to 3 reasons and will be explored with further statistical analysis: (1) families pay more for birds that appear to be healthier, (2) families that are aware of safety risks are more affluent and thus able to afford local chicken, and (3) local chicken are considered to be safer than industrial chicken.

Figure 7.3: Ha Noi consumer food safety concerns



Some evidence exists on revealed preference for safe chicken. "Safety chicken" has been branded by poultry companies, and is largely sold of either crossbred or industrial variety. Most consumers (94%) are aware of this type of chicken and 37 percent of these consumers have tried "safety chicken". Households who choose not to consume safety chicken give inconvenience and distrust of safety as the main reasons. Although it was not included as survey response, several survey participants volunteered that they had heard from others that safety chicken was not tasty (Table 7.1).

Table 7.1: Reasons for not purchasing 'safety' chicken

Reason Given	Percent	Frequency
Not available where regularly shopping	69%	495
Do not trust is safe	39%	276
Not important	8%	59
Too Expensive	6%	44
Word of mouth (people say it is not good)	5%	36
Prefer fresh chicken or not tasty	3%	21

Those who have tried but not continued to consume "safety" chicken cite taste/freshness and convenience as the main reason (Table 7.2). Only 17% of all survey households reported repeated consumption of "safety" chicken and on average paid a premium of almost VND8000 ($0.50). This indicates companies have not been able to develop a safety-branded product that appeals to the majority of the urban market. However this data also gives evidence that a significant premium will be paid for trusted safety-branded chicken. The main reason for this is that companies and large farms do not raise the preferred breeds, and that they are not able to effectively market in the wet markets that most Ha Noi consumers tend to frequent daily and purchase chicken (80% of chicken is purchased in wet markets). These companies also appear to have been able to fully gain the trust of consumers, as indicated by the distrust of consumers for the safety of 'safety chicken.'

Table 7.2: Reasons for only trying "safety" chicken

Reason Given	Percent	Frequency
Not tasty	67%	145
Not convenient/available where regularly shop	31%	66
Not important/only trying	25%	53
Didn't seem safer	7%	15
Too Expensive	5%	10
Prefer Fresh Chicken	1%	3

Stated preference exercises reveal that there is a significant opportunity to market safety-branded chicken, although the experiences above necessitate that this chicken be market conveniently and for high quality local breeds, with attention towards gaining consumer trust. Table 42 shows that about 75% of consumers are willing to pay a premium of 12,500 VND/kg ($0.78) for safety-certified chicken. Although this data would need to be validated with testing and market experiments, it suggested that a cost-effective system of safety certification for local chicken breeds could in theory largely be financed through price increases in urban markets.

Table 7.3: Ha Noi consumers' willingness to pay for safe chicken

Variety	Hypothetical Safety Premium (VN Dong)				Ave. Price
	5,000	7,500	10,000	12,500	
Local	99%	91%	89%	74%	62,000
Crossbred	92%	97%	70%	66%	42,000
Industrial	93%	74%	69%	52%	32,000

Despite these high levels of demand for safe local chicken varieties, excess capacity exists at the farm level for local chicken production. Many small commercial operators are operating well below maximum capacity. This is only partially explained by seasonality of chicken demand. Furthermore, in many districts a large proportion of local chicken is sold into local markets directly to local end users or to local traders. Local (commune) traders report largely dealing in local varieties of chicken, which are sold to rural end users. Very rarely are farmers or market players offered a premium for vaccination or safety certification. Most producers (90%) claimed to sell vaccinated broilers, but only 12 charged some sort of premium. 101 producers (16%) reported providing a safety certificate, but none charged a premium.

Very few traders have requirements for farm safety certification (see Table 7.4) and farms are rarely rewarded for demonstrated improved biosecurity. However, the fact that some districts have higher levels of farm safety certification indicates that there might be some experience with local farm certification.

Table 7.4: Percent of traders requiring farm safety certification

District	Commune Trader	District Trader	Province Trader	Other Province Trader
Gia Binh	3	17	3	1
Tien Du	3	8	3	0
Ly Nhan	3	21	13	14
Kim Bang	5	7	5	4
Soc Son	11	15	34	6
Tu Liem	4	4	0	0
Hoai Duc	20	13	5	0
Phu Xuyen	2	5	23	0
Chuong Mi	0	40	50	20
Dong Anh	22	59	0	0
Yen Phong	0	0	0	57
Total	**7**	**15**	**11**	**4**

Beyond production constraints, the lack of local chicken being raised for urban markets indicates the presence of significant policy-induced barriers, high transaction costs related to aggregation, and/or information failure. Information failure related to the inability of farmers to signal a safe product: mixing of birds by traders hides the identity, origin and risk of the animal. High transactions costs would be related to economies of scale associate with aggregated local

chicken varieties from several smaller farms; it is also exacerbated by lack of organization amongst small commercial farmers. Policy-induced barriers could include regulations that make it difficult for small traders to operate in certain environments; or perhaps require travel over long distances or high fees for certification or inspection. On the production side, the slow growth of local chicken breeds may exacerbate the above factors or be a constraint in itself. The production of crossbred chicken may be an antidote to the various constraints facing local chicken producers. The slow acceptance of industrial chicken and high levels of production of crossbred chicken indicates that it may be a product that can overcome many of the marketing problems associated with local chicken while still providing an acceptable level of 'taste' for consumers.

Given the continued informality of urban local chicken markets and high demand for local chicken varieties that will increase with incomes, better understanding of the cause of this marketing failure is needed to inform policy. Although given current market fragmentation one might expect the importance of small farmers raising local chicken for supplying urban areas to fade with time, the high demand for local varieties and continued rural poverty in Viet Nam the current tenuous system will continue if nothing is done to ensure a more effective marketing systems. Bac Thang Long market is an interesting model for such an improved system. Birds coming into BTL market are often sourced from smaller farms by small traders, and all slaughterhouses are registered. The size of the market is small enough for inspectors to control movement in and out by traders. In such a system, identity of a bird would be relatively easy to preserve, as most traders coming to BTL buy birds directly from farms.

The development of crossbred chicken may be important, as the meat is considered to be relatively tasty and production is more 'commercializable'. In Viet Nam, crossbred chicken are often known as 'free-grazing'; chicken are not caged but have the benefit of being better able to utilize feed inputs. Crossbred chicken require less cash and feed inputs than industrial chicken and hence overcome these significant production constraints. They also grow more quickly, which allows for easier aggregation for market. However, many households in Ha Noi do not yet consume crossbred chicken, likely for several reasons but certainly because it is a relatively new product. Consumer acceptance of crossbred chicken could be a key element for overcoming the current marketing failure.

8. Conclusions and Future Research

Chicken varieties in Viet Nam are highly differentiated by consumers and the choice of variety raised by farmers is largely impacted by farm wealth. These two levels of differentiation have led to a marketing failure for the supply of local chicken in Ha Noi and to market fragmentation that is

not inclusive of poorer producers. Poultry market channels in Viet Nam might be generalized into 2 to 3 groups; in one small farmers produce local chicken and sell to nearby markets or to urban areas through informal channels. In another, medium and large farms sell through formal, regulated channels such as wholesale markets.

Poultry markets in a northern Viet Nam are at a critical juncture. The new, more formal marketing chains are considered to be easier to regulate. However, if smallholders or small traders cannot market local chicken through these channels, they will continue using informal channels due to the high levels of demand for this type of chicken in Ha Noi. Avian influenza needs be controlled through improving of the biosecurity of poultry production. One way to include smallholders in this process is to encourage processing of local chicken in wholesale markets and other formal market channels. The other constraints that producers and traders face should be also considered in the policy-making process. Another option is to support market-driven methods of encouraging smallholders to reduce poultry (and associated human) health risks. Consumers also are concerned about safety and willing to pay a significant premium for credible safety-guaranteed chicken. As indicated in our farm surveys as well as other research, poultry production is important for the incomes of the rural poor. As shown by Ifft *et al.* (2008), poor are involved in all stages of the poultry market chain, not just in production. Inclusion of branded and traceable “safe chicken” from local varieties in urban areas can serve to reduce health risks and to decrease rural poverty.

The key findings of this report, in order of section can be summarized as follows:

1. Production of chicken variety is largely determined by production scale and wealth. Poorer households produce local chicken varieties, while wealthier households produce crossbred and industrial chicken breeds. The production of chicken is constrained by credit requirements, ability to make capital investments and feedstock availability.
2. Market chains are ‘regulated’ by informal agreements for regular purchase between participants. The prevalence of this type of contractual arrangement indicates that producers do not initiate purchase without a certain buyer and that a high level of trust, in the place of legally binding contracts or formal regulations, is necessary for market chains to function.
3. Transportation and scale constraints affect the choice of marketing channels, including choice of vehicle for traders and farm dispersion for small producers raising local chicken. A producer’s choice of trader or end user as a buyer can affect the price received.
4. The nature of regulation experienced by chicken market chain participants varies considerably by location. Larger producers and traders tend to sell into more regulated channels.

5. Markets are becoming increasingly fragmented. Local chicken producers sell mainly to local markets, and into urban markets through more informal channels. This fragmentation is evident in most stages of the market chain.
6. Urban consumers still strongly prefer local chicken that is purchased fresh. Attempts to market "safe chicken" have been limited due to this preference. Despite capacity for increasing local chicken production, the local chicken available in urban areas is double the price of industrial chicken. In this "marketing failure", producers are not rewarded for improving 'biosecurity/-safety'. Recognition of urban demand for local chicken is critical in developing regulations for market chains.

To address these marketing failures, further research in the following areas is recommended:

1. Key constraints faced by small commercial poultry producers
2. Nature of existing informal contractual relationships
3. Barriers to urban market participation and impact of choice of buyer
4. Optimal regulation
5. Feasible mechanism for market integration of smallholders, such as cooperatives
6. Testing marketing for certified/branded/traceable local chicken varieties

9. References and Related Reports

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10. Disclaimer & Contacts

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J. Ifft, D. Roland-Holst, A. Sy, and D. Zilberman
Department of Agricultural and Resource Economics
207Giannini Hall
University of California Berkeley
CA 94720 - 3310 USA
E-mail: dwrh@rdrc.net

Or visit the PPLPI website at: www.fao.org/ag/pplpi.html