PUBLICATION INFORMATION

Value Chain Approaches in a Stagnant Industry: The Case of Furniture Production in Jepara, Indonesia

Abstract

This article assesses impacts of the Jepara Furniture Value Chain project, which was intended to address challenges faced by small-scale furniture producers in Jepara, Indonesia. The assessment focuses on effects of membership in the APKJ, an association started as part of the project. Propensity score matching was used to compare differences in outcome variables for association members and matched non-members. A limited, positive impact of APKJ membership was found. Members have improved their marketing behaviors in ways that will allow them to retain more value compared to non-members. APKJ members are also more likely to have obtained certificates of timber legality. Membership in the APKJ does not have a significant effect on firm profit and there is little evidence of an industry transformation. The paper also provides a critique of indiscriminate use of a value chain approach.

INTRODUCTION

The teak and mahogany carving industry of Jepara, Indonesia has been culturally and economically important to the region for hundreds of years. The industry is now confronted by scarcity of timber, international pressure for assurance of timber legality, and increased international competition (Loebis and Schmitz 2005). Small-scale producers are particularly vulnerable to pressures faced by the industry and suffer additional challenges of limited ability to bargain and obtain higher prices, inadequate access to credit, restricted market access, and lack of knowledge of modern business practices (Purnomo et al. 2013). The Jepara Furniture Value Chain (FVC) project, conducted by the Centre for International Forestry Research (CIFOR) from 2008 to 2013, sought to address challenges faced by small-scale furniture producers in Jepara. This study evaluates impacts of

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membership in the producer association, the *Assosiasi Pengrajin Kecil di Jepara* (APKJ), established as part of the project.

The FVC project applied a value chain approach to a relatively backward industry undergoing stress and experiencing stagnating demand. In contrast to most value chain development efforts, which use buyer-driven engagement responding to growth of new demands, the FVC was producer-driven, focusing on actions to increase profitability of small-scale producers. In a standard value chain exercise, buyer-driven demand or transformation of upstream marketing processes creates pressure to replace traditional market arrangements with new ones (Handschuch, Wollni and Villalobos 2013; Maertens and Swinnen 2012; Maertens, Minten and Swinnen 2012). In the FVC project, the idea was to modernize the furniture value chain in the absence of tangible growth in new markets. Without demand-related rewards, profit gains from value chain improvements can be small, leaving few incentives to participate in upgrading. This is the case in Jepara, where the development of the value chain was not driven by buyer demands; instead the project focused on improvements in actions of suppliers.

The impact of value chain upgrading is assessed by comparing the outcomes of furniture producers who participated in the APKJ to what the outcome would have been without the project. Propensity score matching is used to establish the counterfactual; we match project participants with objectively similar non-participants. This study quantifies economic impacts of the project by comparing firm profits of APKJ members against a counterfactual, and determines the influence of APKJ membership on firm management, marketing and selling behaviour.

We find that APKJ membership is not significantly related to firm profit and there is little evidence of an industry transformation. APKJ members have improved their ability to bargain with buyers, adopted improved marketing behaviors, and are more likely to have obtained certificates of timber legality. However, the organization has not attracted additional members in the four years

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since termination of the project and economic returns to membership are limited, at least in the short- to medium-run.

BACKGROUND

The Jepara Furniture Industry

Jepara District is located in Central Java, Indonesia. Its population, which exceeded 1 million in 2008, is spread over 16 administrative sub-districts called Kecamatan (Anggara et al. 2013). The furniture industry is central to the District's economy. Teak and mahogany carving have been culturally and economically important to the region for hundreds of years, though the strength of the industry has fluctuated over time. The industry was estimated to have employed 120,000 workers and contributed 26% to Jepara's GDP in 2010 (Angarra, Purnomo, and Shantiko 2013; Purnomo et al. 2014). In 2010, Jepara had more than 11,000 log parks, sawmills, ironmongeries, workshops, showrooms and warehouses (Anggara, Purnomo and Shantiko 2013). The vast majority of these units are small in scale and production is relatively rustic.

In Jepara's furniture industry, timber is produced in plantation and (mostly community-based) agro-forests. Furniture wood, mainly teak and mahogany, moves through two distinct networks; wood brokers sell directly to mechanized furniture producers, while in the smaller-scale industry, a focus of the FVC project, wood retailers and sawmill owners sell to small- and medium-scale furniture producers. These furniture producers sell through three channels: to finishing and exporting companies, directly to retailers, and to domestic furniture brokers. Some small-scale producers sell directly to final consumers, either through showrooms or local market sales (Roda et al. 2007; see Purnomo et al. 2014 for a value chain flowchart). Value from small- and medium-scale production is, however, not evenly distributed; small-scale tree producers and small- and medium-

The industry faces several challenges. Increased international competition and timber scarcity represent threats as furniture exports from China and Vietnam enter international and domestic markets. The ASEAN-China free trade agreement of 2012 reduced trade barriers, allowing furniture from China and Vietnam to flood the Indonesian market, adversely affecting market shares and profitability of domestic producers (Purnomo et al. 2014). Timber scarcity has increased the price and lowered the quality of inputs and facilitated development of a large illegal timber trade. Illegal timber harvesting diminishes timber stocks, leads to forest degradation, and jeopardizes industry sustainability. However, purchasing illegal timber is an appealing alternative for furniture producers, as it can reduce timber procurement costs by as much as 60% (Loebis and Schmitz 2005; Yovi, Bahruni and Nurrochmat 2009).

A policy to reduce the illegal timber trade represents another challenge to small-scale furniture producers. A regulation called *Sistem Verifikasi Legalis Kayu* (SVLK) passed in 2009 as a mechanism to certify that timber products are legal. It was created as part of a Voluntary Partnership Agreement with the European Union in accordance with the EU's regulations against import of illegally sourced timber products. Under the SVLK, all exporters must have certification indicating that timber was obtained in compliance with Indonesian law (Fishman and Obidzinski 2015). Requirements for legality certificates vary by operation type. Timber processors (such as furniture producers) must have proof that they are authorized to operate and be able to trace the source of their timber (Fishman and Obidzinski 2015). SVLK requires maintenance of records of purchased timber, a challenge for small-scale producers with limited education. Additionally, certification

requires the business to be formally registered and pay taxes, which discourages small-scale producers from obtaining certification.

Small-scale producers also face challenges due to their scale and to the structure of the industry. They have limited access to markets and credit, low bargaining power, and heavy reliance on middlemen (Anggara, Irawati and Purnomo 2009). Few of these "challenges" are related to a transformation in the ways that furniture moves from producers to end consumers. While actions are needed to enhance the viability of the industry, it is not clear that a value chain approach is proper in the absence of a partnership with downstream buyers (e.g. international brokers and domestic retailers) and lead firms. Of course, the timber legality restrictions as manifest in the SVLK are largely driven by international buyers, but the other challenges are not due to demand-related change in markets.

In order to understand how these factors affect industry actors, the FVC project conducted value chain analysis. This analysis methodically evaluates the range of activities carrying a product from conception to the final consumer (Herr and Muzira 2009). By characterizing and analysing the relationships, incentives, and capacities of actors in the value chain, the analysis identifies system-wide constraints and bottlenecks.

The FVC project analysis found that in most cases value chain actors closer to end consumers capture a larger share of the final product's value. Purnomo et al. (2009) evaluated the distribution of benefits among actors across the value chain. They found that different actors capture different shares of value added. Shares of final value captured by upstream actors are low: teak growers, log traders and sawmills receive 5.6%, 0.9% and 0.6% respectively. Furniture producers and finishers receive 3.6% and 3.2%, while exporters, overseas exporters, and international wholesalers receive 11.4%, 6.1% and 21.9%, respectively. Value-added capture clearly

varies with the "position" of the actor within the value chain. Similar to Purnomo et al. (2009), Effendi and Parlinah (2009) found that retailers capture 52% of product value in the domestic market, and exporters capture 36% of the international market value. Partly as a result of these findings, several FVC project activities focused on "moving producers up" -- training them to engage directly in product marketing.

While export demand may create opportunities for small-scale producers, the furniture export market is increasingly competitive. There is no evidence of emergence of a consolidated export channel into which small-scale producers can enter. The value chain literature largely documents buyer-driven benefits to participation in export markets resulting from emergence of new export channels. For example, literature on participation in global supply chains for vegetable producers consider an established supply chain as the point of departure and show potential benefits to small-scale producers through entry into the chain (Reardon, et al. 2009; van den Broeck, Swinnen and Maertens 2017). Similarly, the literature on the growth of supermarkets in developing countries notes that supermarkets themselves create opportunities for smallholders because of change in demands and opportunities (Reardon, et al. 2003). Ability to up-grade a position in a value-chain comes from the appearance of a new opportunity and, in virtually all cases of successful value chains, private sector actors drive formation of the chain.

In contrast, the FVC project viewed value chain upgrading as a means of addressing market and institutional challenges to industry viability; the project is designed to preserve or enhance opportunities in the absence of a change in downstream purchase processes such as the emergence of new export brokers who focus on the small-scale market. There has been no fundamental change in the Indonesian furniture value chain. As noted by Koponen and Arbelius (2009), value chain

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analysis in the context of declining or stagnant industry suppliers requires a different perspective from that of a vibrant global supply chain.

The Jepara Furniture Value Chain Project

The Jepara Furniture Value Chain Project attempted to address the challenges faced by small-scale furniture producers in Jepara. The FVC project began in August 2008 as a collaboration between the CIFOR, the Forestry Research and Development Agency of the Indonesian Ministry of Forestry and the Faculty of Forestry of Bogor Agricultural University. It built upon an EU-funded project, "Levelling the Playing Field", conducted from 2003–2007. Value chain analysis and other research undertaken as part of this earlier project informed the FVC project. Project objectives were to: (i) enhance the structure and function of the furniture industry for the benefit of small-scale producers; (ii) improve marketing by small-scale producers and their industry associations; and (iii) monitor the effects and early acceptance of innovations from objectives 1 and 2 (Purnomo et al. 2013).

The value chain upgrading approach employs value chain analysis to develop a strategy for system change and upgrading (Herr and Muzira 2009). Upgrading consists of changes to enhance competitiveness by improving the efficiency of operations or adopting new activities (Humphrey and Schmitz 2002; Kaplinsky and Morris 2000). Three specific types of upgrading have been identified in the literature: *process upgrading* through adoption of improved technologies; *product upgrading*, or moving into higher value or more sophisticated product lines; and *functional upgrading* by acquiring new functions to increase the overall skill content of activities (Humphrey and Schmitz, 2002, p. 1020). Functional upgrading involves increasing the capture of value added by changing activities conducted as a normal part of doing businesses. For example, it might involve changing accounting or logistic functions (either undertaking such activities within the firm or outsourcing to

others), adding design functions, or others (Kaplinsky and Morris, 2000, p. 42). A fourth type of upgrading-*intersectoral upgrading-* is not relevant for the study. The FVC project analysis provided insights into the particular forms of upgrading needed by specific kinds of producers to enable insertion into more modern furniture value chains.

The participatory action research conducted by the FVC project provided an opportunity for small-scale furniture producers to voice a need for "an industry association through which they could increase their market access, enhance their design skills and product quality, and improve their access to credit"(Purnomo et al. 2013). The project implemented four integrated 'upgrading scenarios': moving-up, collaborating down, green certification, and formation of a producer association; each of these was in some way related to the upgrading concepts outlined above. The links in the FVC project between the upgrading scenarios and the upgrading concepts in the value-chain literature are described below. In the Formation of the *Asosiasi Pengrajin Kecil Jepara* (APKJ), small producer's association of Jepara, was the lynchpin, facilitating implementation of the other scenarios by bringing producers together to participate in training, improve marketing, form credit cooperatives, and obtain group certification.

The moving-up scenario promoted functional and product upgrading. Functional upgrading involved empowering producers to move into downstream positions on the value chain, and included activities to increase the ability to capture value by finishing, marketing, and trading. Improved finishing techniques were taught to female APKJ members through workshops that trained in sanding skills, incorporation of modern designs into finished products, and quality improvement during the finishing process (Purnomo et al. 2014). Product upgrading was promoted by training producers in marketing and product quality and process upgrading was promoted by training in and facilitating use of more sophisticated marketing methods. A website was created to showcase and sell the products of APKJ members. This webpage facilitated transactions totalling

around IDR 100 million ($7,857 US at the exchange rate on June 28, 2015) from 2010 to 2013 (Purnomo et al. 2013), but the retail side of the website has been disabled due to hacking. Participation in exhibitions was another effort at process upgrading for APKJ members. Project participants attended 14 trade shows and exhibitions, one of which was held in China and another in India (Purnomo et al. 2013). Successful upgrading would lead to workshops selling high-quality, finished products and engaging in sophisticated marketing mechanisms such as online marketing.

The collaborating-down set of activities contained some process and some product upgrading. These activities sought to strengthen linkages between furniture producers and lower stages in the value chain; for example, APKJ producers were encouraged to seek alternative and regular sources of timber suppliers. The benefits of contractual arrangements were highlighted and other forms of input supply management were stressed as a part of this training. The expectation of the project was that active collaboration between furniture producers and their input suppliers would lower and lead to less variability in input costs for furniture producers.

Green certification activities, a form of product upgrading, supported producers in obtaining SVLK certification. Following certification, the same products are sold, but product quality (and price received) has been improved, reflecting an upgrading of the product. The project provided trainings in record-keeping, "chain of custody certification", and in application for and maintenance of green certification. The APKJ facilitated formation of groups to obtain group certification (Purnomo et al. 2013). Sustainable timber certification can add value to furniture, acting as a form of product differentiation.

The association scenario helped facilitate other project activities and promoted all three forms of upgrading. Trainings covered topics such as financial management, entrepreneurship, quality control, finishing, carving, and furniture design. Training stimulated establishment of small

credit cooperatives of APKJ members. APKJ members formed groups to obtain SVLK certification (Van Geenhuizen, Indarti, and Soetanto 2010).

The FVC project also assisted in development of a strategic plan to address challenges faced by the furniture industry. Various stakeholders, including APKJ members, were brought together to identify potential actions by the district-level government in support of the industry. The plan was made into district law as a PERDA. The PERDA provides a regulatory foundation and budget for supporting small-scale furniture producers in marketing, production, certification and institution strengthening (Purnomo et al. 2016). The PERDA influenced budget allocations in 2015 and additional actions were implemented in 2016, but it is too soon to evaluate its effectiveness.

This assessment focuses on the effect of membership in the APKJ, and is especially appropriate as the project began some six years prior to the evaluation. The project never set up a data panel for evaluation, so propensity score matching (PSM) was used to compare outcome variables of association members and matched non-members. Propensity score matching requires observations on covariates that are either unchanging or observed prior to selection into the event in question (in this case, participation in the APKJ). A 2009 presidential election in Indonesia provides a well-known point of reference for asking retrospective questions. Responses to these questions enabled estimation of a propensity score and estimates of changes in production and marketing behavior. Firm profit and adoption of specific upgrading activities were outcomes.

METHODS

Participation in the APKJ was non-random because individual producers decided to join. Characteristics that lead a furniture maker to join the APKJ may also influence the outcome variables such as profits or marketing behavior, and a simple comparison of member to non-members outcomes may lead to a biased estimate of the impact of membership. Several alternatives

exist to overcome this selection bias. Propensity score matching, described below, was used in this case.

Propensity Score Matching

Propensity score matching minimizes selection bias by matching treated and non-treated units on their probability of receiving treatment (join the APKJ), and reduces dimensionality by allowing matching to occur with only one variable (the propensity score) (Rosenbaum and Rubin 1983). The probability of treatment conditional on characteristics, called the propensity score, is not known, but can be estimated by regressing a binary dependent variable reflecting membership in the APKJ on observable pre-treatment and time-invariant characteristics.

Various algorithms are available for using the estimated propensity score to match or weight units (Khandker et al. 2010; Ichino et al. 2008). Nearest neighbour matching, used in this study, compares a treated unit to a fixed number of control units with the closest valued propensity scores to obtain the treatment effect. Matching was implemented to one nearest neighbour with replacement, allowing the same control unit to be matched to multiple treated units. Matching without replacement can cause bias by matching treated units to dissimilar control units, and requires a determination on the order of matching (Dehejia and Wahba 2002).

In order to use the propensity score, two assumptions must be met: conditional independence and common support. Conditional independence means that *not* participating in a program (i.e. joining the APKJ) is completely explained by observable characteristics (Khandker et al. 2010; Ichino et al. 2008; Caliendo and Kopeinig 2008). The average treatment effect on the treated (ATET) focuses explicitly on effects of program participation on actual participants in order to determine the impact of membership.

The second critical assumption of PSM is the presence of common support: there must be sufficient overlap in the propensity scores of the treatment and control groups to run analysis that compares individuals with similar scores. Without common support, no comparisons between groups could be made, and PSM could not be used (Caliendo and Kopeinig 2008). There may be ranges within the range of common support where there are not neighbours that are close enough for good matches. Specifying a caliper, or maximum distance between the propensity scores of matched units, can address gaps in common support, and increase the similarity of the treated and control groups. A caliper was used equal to 0.2 times the standard deviation of the logit model used to calculate the propensity score, following Austin (2011).

Data Collection

Data were obtained from a 2015 survey of 598 furniture makers in Jepara, of which 121 were APKJ members and others were identified at random from a list of area producers. The survey instrument collected information on outcome variables, including marketing initiatives, business practices, and profit. The largest portion of the survey consisted of questions used to estimate profit as accurately as possible. The survey also gathered data on firm and owner characteristics expected to influence participation in the APKJ. In order to be able to use information about a firm's operations as covariates, it was necessary to gather information about firm activities in 2009, before the APKJ was formed. Retrospective questions focused on relatively important outcomes, such as product types, source and type of timber, marketing methods, sales channels and sales modalities, and labor use in 2009. Recalls of these variables should be of good quality since a presidential election was held in 2009, providing a temporal reference to assist in framing the response.

The survey instrument contains ten sections. The first two gathered information about the firm and owner. Section three focused on firm characteristics, including type of unit, year started, and size. Section four obtained the retrospective information on firm and product characteristics.

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Section five gathered information on current sales channels and marketing methods. Sections six

through nine collected data for estimation of the primary outcome variable of interest, profit.

Section ten garnered information on ownership of capital equipment and vehicles. Enumerators also

asked about assets owned in 2009 not owned currently. The last section asked respondents about

participation in training held by the Jepara FVC project.

Propensity Score Estimation

Studies using PSM to evaluate impacts from membership in a cooperative or association

follow the same logic as technology adoption studies when specifying the model to calculate the

propensity score. Factors affecting participation in the APKJ are associated with expectations about

net benefits of APKJ membership. Covariates typically include decision-maker age and education,

membership in other organizations (related to social networks), location, asset ownership, labour

utilization, type of operations and measures of operation size (Verhofstadt and Maertens 2014;

Wollni and Zeller 2007; Ruben and Zuniga 2010; Rodriguez, Rejesus, and Aragon 2007). These

categories of covariates were also used to predict participation in the APKJ, with a focus on those

providing insight to a firm's operations and position on the value chain. As current operations could

be affected by participation in the APKJ, covariates measuring specifics about firm operations, such

as sales channel or type of wood used, are 2009 recall values. Other time-invariant covariates, such

as owner's level of education and firm location, use current values.

Covariates

The propensity score is estimated using a logit model with thirty eight covariates. Since the

concern is to generate a model that best describes participation and attains balance, extraneous

variables, which can be associated with multicolinearity and inefficiently estimated parameters, are

not viewed as a problem (Austin, 2008, 2009; Garrido et al. 2014; Wyss et al. 2013). A valid

evaluation of the propensity score focuses on the extent to which our matching reduces bias in the matched sample is examined in some detail using the imbalance rate and an assessment of common support overlap (Austin 2009; Garrido et al., 2014).

A woodworking equipment index was included as an indicator of firm size and sophistication (table 1). Twelve woodworking equipment categories reflected the degree of sophistication and scale of operation and included the following: whipsaw, circle saw, chainsaw, jointer, etc. Principal Component Analysis (PCA), which creates factor weights for covariates that are correlated across multiple dimensions and collapses them into a single woodworking equipment index (Fry, Firestone and Chakraborty, 2014). From the set of correlated variables, uncorrelated linear weighted combinations of variables (components) are created. The eigenvectors of the correlation matrix provide the factor weights for these principal components, and their variance is given by the eigenvalue of the corresponding eigenvector. The first principal component, which is used to create an index, explains the maximal overall variance, thereby maximizing discrimination between observations (Larochelle, Alwang and Taruvinga, 2014; McKenzie, 2003).

In addition the equipment index, several covariates reflect the scale of the firm's operations. An average of workers in the high, low and normal seasons during 2009 is used as a measure of firm scale. Total workshop area in 2009 provides an additional measure of firm scale. The number workshops owned in 2009 was also included as a variable, as was the number of showrooms owned. Other business units related to the furniture industry were owned by some firms, including showrooms, sawmills, kilns, and hardware stores and a dummy variable was included to reflect ownership of other units in 2009. At a statistically significant level, APKJ members had more workers and more non-workshop business units than non-members, but other differences were not significant.

Types of wood used for furniture production in 2009, recalled by survey respondents, included teak, mahogany, mango, coconut, jackfruit, trembesi, sonokeling, and others. Teak and mahogany were most common. The percent of teak and mahogany were used as variables in the model. Binary variables indicate whether the teak/mahogany was sourced from Perum Perhutani, the offical state supplier of timber. Differences between members and non-members are not significant (table 1).

The questionnaire gathered information about the way products are sold: sales channels, specific buyers and the state of contractual arrangements between producers and those to whom they sell their products, and marketing. This information was combined to generate variables to reflect sophistication of sales strategies and the purchasers of furniture buyers, which include brokers, wholesalers and final users (table 1). Binary variables indicate the broad categories of furniture produced in 2009. Basic furniture types were placed in single category that included vanity tables, beds, cabinets/wardrobes, chairs and tables and the catchall "other furniture types". Separate binary variables were included for the production of wooden ornaments, calligraphy pieces, room dividers, and relief, the production of which suggest some level of specialization. An additional variable was included for production of furniture components (such as chair and table legs); this production suggests a lower level of upgrading than a firm that produces whole furniture pieces.

Insert table 1 about here

When data on furniture produced in 2009 was missing, it was assumed that furniture production in 2009 was the same as production in 2015. Four percent of sampled non-members who were operating in 2015 were missing data for furniture types in 2009, and 3% of APKJ members who were operating in 2015 were missing data for furniture types in 2009. More APKJ members than non-members produced carved decorations, calligraphy, room dividers and relief,

implying a higher level of sophistication. However, more APKJ members than non-members also produced furniture pieces, an indication of less sophistication (table 1).

Variables about production processes capture information about the firm's level of upgrading and its position of power within the value chain. Finishing furniture is a high value-added activity. Respondents were asked to estimate the percent of production that was finished in-house, the percent that was contracted out to be finished, and the percent that was sold unfinished. If a firm is contracting out work to another firm, it holds a position of relative power over the firm that it has contracted to do the work. The final model included binary variables reflecting the processes used by the firm in 2009 (table 1).

Estimation

The estimated logit model had 11 significant covariates (at 5 percent) and a pseudo-R^2 of .34 (table 2). In addition to overall model fit, the signs of coefficients were consistent with expectations. Since the model is predicting participation in a program offering enhanced skills to small-scale producers, already advanced producers, such as those with more workshops and those with existing contracts with downstream buyers, such as brokers (both measured in 2009), were significantly less likely to participate in the APKJ. As the program was targeted to areas where disseminated information was more likely to spread, location in a Kecamatan was associated with more likely participation. Three of the six Kecamatan dummy variables has significantly positive coefficients and two of the remaining three were also positive. Since the comparison group was furniture producers located in low-density areas, the positive signs were consistent with the way the project was targeted. As expected, better-educated owners were more likely than those without primary education to participate in the APKJ, with the highest likelihood of participation and most

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significant coefficient for the highest-educated class of owners. All of these findings were consistent with logic and prior expectations.

In order assure common support, the propensity score was also estimated with the caliper noted above. Thirteen members did not have matches within the caliper and were dropped during estimation (table 2 shows estimates from the logit model without and with the caliper). Following estimation, observations with the eight highest propensity scores were dropped, as well as five observations with propensity scores between 0.82 and 0.85. Common support after matching to one nearest neighbour within a caliper is shown in figure 1.

After matching, distributions of covariates should be balanced between treatment and control groups. Two-sided t-tests were used to evaluate post-matching covariate balance, and four (out of 40) covariates were found to be significantly different between groups. While significant differences suggest that covariates are not uniformly balanced, a ten % imbalance rate following matching is consistent with expectations. All in all, the analysis shows an acceptable use of matching procedures. The estimating (participation) equation had reasonable fit (especially considering that it was estimated with cross-sectional data) and the signs and significance of the variables were consistent with expectations. The resulting matches were well-balanced in the covariates. As an additional check, treatment effects were estimated using matching without replacement (the results here are with replacement) which can result in higher bias, but can also reduce the variance of the estimator. The results obtained from matching without replacement are qualitatively similar to those reported here; in particular APKJ is linked with some improvement, but the effect is limited. Profits are not significantly different between members and non-members in either case (results available from author on request).

RESULTS

Impact of Membership on Firm Profits

Fulfilment of the first objective, to quantify the livelihood impact of the project by comparing firm profits of APKJ members against a counterfactual, required examining profit as an outcome variable. Benefits from any upgrading undertaken were predicted to be reflected as an increase in profit. Firm profit was estimated based on information on costs and revenues collected during interviews. Because profit measurement requires detailed information on inputs and outputs, 2009 recall data could not be used and the comparison is based on differences in levels of profits between APKJ members and matched non-members in 2015. Costs included in profit estimation are: wood inputs, labor expenses, contracting-out costs, and other inputs and expenses such as transportation, fuel, electricity, and oil/wax finishes. Rent on capital was not included as a cost.

This manner of accounting for firm profits is subject to limitations. The timing of input purchases and output sales may not have always lined up properly, seasonality adjustments were approximations, and variations in production and prices were not captured by the survey. Prior to analysis, observations with very high or very low levels of profit were re-examined. Fifteen observations were dropped because their profit estimations were unrealistically high or low, or they were missing critical data.

Despite multiple steps to correct the profit measure, it is still imprecise; a large range in estimated profit levels was found between members (treated) and non-members (untreated) groups

before (figure 2) and after matching (figure 3). Furthermore, as other upgrading activities are undertaken, profit gains may be slow in coming as adopters gain experience and gradually increase profit. Still, the profit outcome variable is useful for providing a comprehensive (though imprecise) measure of the impact of APKJ membership on small firms.

Using PSM, the impact of membership on profit was found to be non-significant (table 3). The analysis was also conducted with more restricted samples. PSM was applied to samples that excluded: (i) firms whose 2015 operations included brokering; (ii) firms that engaged in brokering or owned a showroom in 2015; and, (iii) firms with extreme profit levels above $80,000. The treatment effects calculated using the restricted samples were also not significant (see table 3), but the results show that several of the matched firms had very large profits, confirming earlier evidence of substantial heterogeneity. Profits are not affected by APKJ membership even six years after the project commenced. The lack of effect on profit likely explains why APKJ membership has not grown over time; economic incentives are such that there is no short-term economic reward from membership.

Insert table 3 about here

APKJ Membership and Upgrading Sales Activities

Determining the influence of APKJ membership on the uptake of upgraded marketing and sales channels required estimating treatment effects for variables reflecting changes over time in sales channels and marketing methods. Either adding or abandoning a sales channel can be seen as functional upgrading, depending on the sophistication of the channel in question. For example, adding an internet-based sales channel can be viewed as upgrading, while abandoning sales in low-value local markets can likewise be considered upgrading. Different sales channels can also be

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evidence of product upgrading if the new sales channel change leads to higher prices to the producers. Binary variables were created to reflect addition or abandonment of marketing/sales channels between 2009 and 2015.

Several significant differences in sales and marketing behaviour were observed between members and matched non-members, with differences emerging for the addition and abandonment of marketing and sales channels (table 4). A significant positive relationship was found between exhibition attendance and APKJ membership. Twelve percent more APKJ members than the matched counterfactual adopted the practice of selling through exhibitions. Addition of exhibition attendance as a sales and marketing channel indicates functional upgrading through increased marketing sophistication and establishment of new marketing channels.

Insert table 4 about here

As opposed to selling to purchasing agents and other institutional buyers, selling directly to final consumers, whether foreign or domestic, indicates that a firm has an advanced position on the value chain and is another example of functional upgrading. Since we do not observe the quality and attributes of furniture sold through these channels, we cannot be sure whether product upgrading has occurred as a part of this process. At the 5% significance level, 12% more APKJ members than matched non-members began selling directly to foreign purchasers (final consumers and wholesalers/brokers) between 2009 and 2015. However, 5% more APKJ members than matched non-members also abandoned selling directly to foreign buyers over the same time period; on net, APKJ membership is associated with a 7% increase in adoption of these practices.

A firm that sells directly to domestic consumers, another form of functional upgrading, also has more bargaining power. When producers interact directly with buyers, price and furniture specifications can be negotiated. At the 1% significance level, 12% more APKJ members than

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matched non-members began selling directly to domestic consumers between 2009 and 2015, suggesting that the APKJ helped small-scale furniture producers shift to sales channels with more opportunity for negotiation, an example of functional upgrading. Although APKJ members were also more likely to abandon this channel, the difference was not statistically significant and we can say that there is evidence of upgrading by APKJ members through changes in sales channels.

APKJ membership had a significant, positive effect on abandoning selling through an exporter. Selling furniture through an exporter suggests that a firm is capable of adhering to international standards, but the practice involves directed networks in which exporters, not producers, have bargaining power. It is unclear whether this change would be considered evidence of upgrading.

No significant relationship was found between APKJ membership and use of online marketing. The relationship between APKJ membership and change in selling through other showrooms was also not significant. Either adding or abandoning selling through domestic showrooms could be seen as upgrading. While producers who sell to other showrooms are not able to negotiate directly with end-users, the relationship between producers and domestic showrooms is based on marketing principles, encouraging producers to maintain high quality, and there is a possibility of moving to a balanced network, evidence of upgrading (Irawati et al. 2010). In either case, no statistically significant changes in activities between members and matched non-members was observed.

Membership in the APKJ also had no significant effect on changes in selling to brokers, or on being subcontracted by other firms. Selling to a broker and being subcontracted both represent positions of very low bargaining power, where the buyer defines the product and the price. However, subcontracting might be associated with a means of entry into a higher-return value chain; for example many suppliers of fruits and vegetables are contracted and this contract (a form of

functional upgrading) has frequently been found to benefit producers (Barrett et al. 2011). A larger percentage of APKJ members than matched non-members started being subcontracted between 2009 and 2015, and fewer members abandoned being subcontracted than in the counterfactual group. This result could be interpreted as representing a possible failure of the project to increase market power among the most vulnerable members. It could also be interpreted as an indication that the project helped inject small-scale producers into more lucrative marketing channels. The latter conclusion is, however, not overly convincing because there is no evidence of higher profits from APKJ participation.

While sales to brokers have not changed for members versus non-members, actual participation in brokering has increased for members. Six percent more APKJ members than matched non-members changed from not brokering in 2009 to brokering in 2015. Brokering is a position with substantial bargaining power, and firms engaged in brokering receive a larger portion of the final price than firms focusing only on carving wood. Brokering requires business acumen that APKJ training workshops sought to impart; with respect to the brokering, the project has led to upgrading.

Findings demonstrate uneven success of the project's efforts to achieve functional upgrading by improving marketing practices and bargaining power for small-scale furniture producers. Producers are more likely to abandon selling through brokers and agents and begin selling directly to consumers (foreign and domestic), and at exhibitions if they are members of the APKJ than if they did not join the association. Members, however, are more likely to abandon selling directly to foreign consumers and are no more likely to abandon being subcontracted or add online marketing than if they had not joined. Members are also more engaged in furniture brokering, further evidence of upgrading. The Jepara FVC met with the most success when the APKJ facilitated a specific behaviour such as exhibition attendance.

Further Functional Upgrading Activities

To understand whether membership in APKJ led to changes in selling finished furniture, we examine changes in sales of finished furniture. The results, reported in table 5, indicate that APKJ membership was negatively associated with this type of upgrading. About 14 percentage point fewer APKJ members than matched non-members began selling finished furniture between 2009 and 2015. Finishing is an 'upgraded' process that allows firms to attain a larger share of the final price than they would through carving alone, and requires skills and knowledge that were taught in APKJ training workshops. The results indicate that the Project was not successful in promoting such upgrading.

Insert table 5 about here

Process Upgrading via Changes in Business Practices

The fourth objective of this study was to determine if APKJ membership increased the likelihood that the participating firm engages in upgrading by employing good business management practices. Project training workshops encouraged application of good practices such as record-keeping and officially registering the business. The project also facilitated obtaining SVLK certification. Results for business registration and SVLK certification show that APKJ members are more likely than non-members to have good business management practices, although members are no more likely than non-members to keep business records (table 6). To the extent that SVLK led to higher-quality (and higher-priced) products, this certification is also an example of product upgrading.

Insert table 6 about here

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Eight percent more APKJ members than matched non-members were SVLK certified in 2015. Empowering small-scale producers to obtain SVLK certification was a key focus of the FVC project. While only a modest number of members obtained certification, the treatment effect shows that the influence of membership on obtaining certification is positive and significant. APKJ membership does not have a significant effect on improvements in record-keeping, but does have a significant effect on whether a business is registered. Thirteen percent more members than matched non-members have formally registered businesses (significant at the 10% level).

Qualitative Survey Responses

The survey also asked respondents directly about their perceptions of benefits of APKJ membership (table 7). Ninety members (67% of respondents who were members) listed training as a benefit. Eight (7%) listed improved credit access, 15 (13%) listed improved market access, 12 (10%) listed increased access to raw materials, and 10 (8%) listed help with means of production. Several members added comments about the APKJ. Forty-two said they had gained insight, knowledge, market access, experience or opportunities, and 11 emphasized the opportunity to build relationships that the APKJ had created. However, 15 commented that they had not experienced any benefit from the association. Two of these members had joined late, in 2013, missing the training sessions.

<div align="center">

Insert table 7 about here

</div>

A major weakness of the project that became clear over the course of the study was the inability for the APKJ to thrive independent of the Jepara FVC project. Membership has not grown since 2013 with current membership of 125. Activities encouraged by the FVC project such as planting fast-growing teak have waned. Additional training sessions have not been provided. Since training sessions were a primary advantage of membership, the subsequent lack of training helps

explain why membership has not grown. It is also clear that the project lacked the potential for articulation of members into established value-chains. As a result, membership was no guarantee of increased returns or access to a stable market, short-run profit differentials were not found, and economic incentives for membership were minor.

DISCUSSION and CONCLUSION

Findings indicate a modest positive impact of APKJ membership. While no significant difference in profit was attributable to membership, other outcome variables indicate some influence on members' marketing and business practices, with most of the influence being observed through attempts to establish new marketing channels and assuming new marketing and trading functions. The net influence of APKJ membership is ambiguous: members improved in some regards, but not in others.

Several factors limited the study. First, training by the project was not limited to APKJ members, meaning that the control group may have been contaminated. Second, the study used data on what a respondent could recall about their operations six years prior to the evaluation. The recall data are included in estimation of the propensity score, and are employed used to measure changes in outcomes. While the timing of the 2009 presidential election may have assisted in creating a time reference, six years is a long time to recall business practices and other factors.

Profit is estimated using survey responses and do not include costs such as rent or a mortgage, depreciation expenses or debt expenses. Wood purchases tend to be irregular and we faced difficulty in getting a full accounting of them. Production and input time spans are not uniform so information for costs and revenues may not correspond, and assumptions about seasonality and consistency were used when scaling up costs and revenues to an annual basis. Furthermore, the likelihood of getting significant results with the profit outcome variable is limited

by the small sample size for treated units and the large variance in estimated profit. Increased profit is a longer-term goal of the FVC project and it is not surprising that significant differences in profits were not detected over the short-medium term.

The FVC project assumed that project activities would affect the entire furniture industry of Jepara. The policy roadmap discussed above works towards this objective, but its efficacy cannot yet be evaluated. An assessment report being drafted by CIFOR notes the important role of CIFOR in passing the legislation, and is optimistic about the capacity of the policy to improve the structure and function of the Jepara furniture value chain. Portions of local budgets have been allocated to implement this policy (Purnomo et al. 2016).

While the APKJ did not significantly alter the structure of the value chain for the benefit of small-scale producers, participation in the APKJ improved bargaining power of some members. In contrast to most value chain development efforts, which use engagement of large-scale buyers to effect transformation of a value chain, the FVC was producer-driven, focusing on actions to increase the profitability of small-scale producers. This improvement was mainly effected through training in more sophisticated marketing processes. A significantly higher percentage of APKJ members than matched control units abandoned selling to a broker, which affords little power for negotiation in product specification or pricing. Additionally, a significantly higher percentage of APKJ members began brokering, a position with market power that claims a large portion of the product's final value. More APKJ members than non-members obtained SVLK certification, providing opportunities to sell to buyers in Europe. Additionally, there is some evidence that membership in the APKJ membership improved the ability of members to function within the current structure of the value chain. This evidence was found in the statistical results; the qualitative interviews with APKJ members also uncovered evidence of enhanced satisfaction with marketing activities post-project.

Functional upgrading was also evident in increased marketing activities. More APKJ members than non-members began marketing through exhibitions, affording the opportunity to interact directly with consumers and develop their own brand. None of these changes, however, affected firm profit, possibly because of the relatively short time between implementation and evaluation, possibly because profit measurement was fraught with difficulty.

Knowledge generated by the project allowed researchers to pinpoint inefficiencies in the value chain. Many of the challenges identified during the value chain analysis, such as timber scarcity, lack of access to credit, low bargaining power, and international competition cannot be addressed by a single project or policy. The absence of a large, well-defined marketing channel limited the ability of the project and subsequent actions by APKJ members to effect changes.

The treatment effects for upgrading outcomes indicate that APKJ members changed more (for better and for worse) than matched control units. These bimodal outcomes may indicate that the APKJ attracts two types of furniture producers: those whose businesses are floundering join the APKJ in hopes of improvement, and others who are particularly motivated and view the APKJ as an opportunity to improve its business activities. The APKJ did not succeed in improving firms of the first type, but those of the second were able to leverage the opportunities and resources of the APKJ to improve their businesses.

Using a value chain perspective, the FVC project viewed upgrading as a means to improve all producers' livelihoods. While some upgrading activities such as obtaining SVLK certification and improving product quality add value to current production, the project also promoted moving up in the value chain. Shifting to or incorporating a higher stage in the value chain, such as finishing furniture or brokering, has potential to allow an individual to realize a larger portion of the final value of a product. However, uniformly encouraging producers to move up ignores the economic principles of specialization and comparative advantage, and disregards the interdependence of value

chain actors. Since actors are needed at all levels of the chain, encouraging all actors to move up is not a sustainable solution to challenges facing the industry.

Furthermore, anticipated impacts of the project relied on expectations that APKJ members would share knowledge, and that the APKJ would grow over time. These expectations were not realized. The project directly engaged only with APKJ members and other attendees of training sessions, a small portion of furniture producers in Jepara. As of 2015, APKJ membership totals 125, while there are more than 11,000 business units in the industry. Project designers must be wary of basing expectation on assumptions such as independent growth of the APKJ, particularly when membership is associated with limited opportunities for profit growth.

Not all value chains are ripe for "improvement". In contrast to most dynamic value chains, the Jepara case was an example of an attempt to improve the value chain without fundamental demand change by marketing agents and other furniture buyers. While demand in Europe has grown for certified wood products, the structure of the market has not changed. Development of high-value market chains is likely to occur only where opportunities for profit stimulate interest of the private sector and changes in demands by marketing agents and other large-scale buyers, in turn, create space for upgrading of value chain participants. Successful value-chain projects link producers to a dynamic chain that is, in turn, linked to a tangible external demand (they are buyer-driven). This was not the case in Jepara where domestic and international challenges endangered the furniture industry, but no emergent marketing channel was present. While demand for timber legality is driven by international buyers, this demand did nothing to create a specific opportunity for Jepara producers. In the absence of a dynamic large-scale market to which producers can be articulated, attempts to enhance value chains may be fraught.

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Table 1: Covariates used in generating propensity score, by APKJ membership

Variables (ᶦrepresents dummy variable)	Variable name	Members	Non-	Diff.
Machine score				
First component from PCA on machines owned	mach_score	-0.22 (*2.01*)	0 (*1.66*)	-0.21
Firm scale (2009)				
Average number workers	no_work	29(*22*)	23 (*26*)	6.31***
Area of workshop(s)	area_work	198 (*237*)	154 (*231*)	43.65
Showrooms owned by firm	no_show	0.99 (*0.25*)	1 (*0.15*)	-0.01
Workshops owned by firm	no_works	0.1 (*0.3*)	0.09 (*0.28*)	0.01
Other facilities owned by firm	no_fac	0.19 (0.48)	0.05 (0.25)	0.14***
Wood use and source (2009)				
Percent of wood, teak	teak_pct	61 (*46*)	76 (*41*)	-14.4
Percent of wood, mahogany	mahog_pct	25 (*40*)	18 (*35*)	7.2
Teak purchased from state-owned timber supplierᶦ	teak_state	0.43 (*0.5*)	0.44 (*0.5*)	-0.01
Mahogany purchased from state timber supplierᶦ	mahog_state	0.15 (0.36)	0.09 (0.29)	0.06
Sales channel variables (2009)				
Sells through broker or trader ᶦ	sell_brok	0.09 (*0.03*)	0.02 (*0.01*)	0.07**
Sells directly to buyersᶦ	sell_buy	0.33 (*0.47*)	0.38 (*0.49*)	-0.05
Sells through showroom with different owner ᶦ	sell_othsh	0.44 (*0.50*)	0.43 (*0.50*)	0.01
Sells furniture online ᶦ	sell_online	0.05 (*0.22*)	0.01 (*0.10*)	0.04*
Sells through exhibitionsᶦ	sell_exh	0.12 (*0.33*)	0.01 (*0.09*)	0.12***
Sells furniture to exportersᶦ	sell_exp	0.58 (*0.50*)	0.46 (*0.50*)	0.11**
Firm is subcontracted ᶦ	subcontract	0.36 (0.48)	0.33 (0.47)	0.03
Furniture type (2009)				
Produces decorative ornamentsᶦ	ornaments	0.04 (*0.2*)	0.02 (*0.12*)	0.03*
Produces carved calligraphyᶦ	calligraphy	0.14 (*0.35*)	0.01 (*0.1*)	0.13***
Produces room dividersᶦ	dividers	0.08 (*0.27*)	0.03(*0.18*)	0.04**
Produces reliefᶦ	relief	0.05(*0.22*)	0.01(*0.11*)	0.04**
Produces componentsᶦ	components	0.04 (*0.2*)	0.02 (*0.12*)	0.03**
Produces basic types: chairs and tables, beds, etc.ᶦ	basic	0.96 (0.02)	0.97 (0.17)	-0.01
Production processes (2009)				
Finished some or all furnitureᶦ	finish	0.29 (*0.45*)	0.17 (*0.38*)	0.11**
Contracted out some or all construction/assemblyᶦ	contract	0.06 (*0.24*)	0.07 (*0.26*)	-0.01
Engaged in brokeringᶦ	broker	0.02 (0.15)	0.01 (0.09)	0.02
Owner characteristics (2015 values)				
Educ. of owner: less than primaryᶦ	(omitted)	0.01(*0.11*)	0.1(*0.3*)	-0.09
Educ. of owner: primaryᶦ	edu_prim	0.18(*0.39*)	0.44(*0.5*)	-0.27***
Educ. of owner: junior secondaryᶦ	edu_js	0.27 (*0.45*)	0.21(*0.41*)	0.06
Educ.of owner: upper secondary, technical trackᶦ	edu_ust	0.02(*0.15*)	0.03(*0.16*)	0
Educ. of owner: upper secondary, academic trackᶦ	edu_usa	0.29(*0.45*)	0.21(*0.41*)	0.08
Educ. of owner: tertiaryᶦ (S1, S2, S3)	edu_high	0.23 (*0.42*)	0.01 (*0.1*)	0.22***
Age of firm owner in years	age	45(*9*)	48 (*9*)	-2.31**
No. of organizations of which owner is a memberᶦ	no_org	0.05	0.01	0.04

Note: Standard deviations in parentheses. Binary variables were included for all Kecamatan (Jepara, Kedung, Mlonggo, Pakasaji, Tahunan). Tests of differences for binary variables were conducted using a proportions test (prtest in Stata). *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 2: Logit estimates of determinants of participation in APKJ (propensity score generation).

Variable	Coef.	Std. Err.	P>z	After caliper		
				Coef.	Std. Err.	P>z
mach_score	-0.075	0.104	0.47	-0.062	0.107	0.564
no_work	-0.002	0.006	0.751	-0.001	0.006	0.903
area_work	0.001	0.001	0.234	0.001	0.001	0.399
no_show	-0.993	0.917	0.279	-0.686	1.021	0.502
no_works	-1.290	0.669	0.054	-1.369	0.723	0.058
no_fac	1.213	0.413	0.003	1.163	0.426	0.006
teak_pct	-0.008	0.006	0.211	-0.007	0.006	0.238
mahog_pct	-0.008	0.007	0.233	-0.009	0.007	0.233
teak_state	-0.095	0.368	0.795	-0.166	0.368	0.652
mahoni_state	-0.296	0.569	0.603	-0.277	0.571	0.628
sell_brok	0.092	0.376	0.807	-0.014	0.385	0.971
sell_buy	0.756	0.378	0.046	0.806	0.384	0.036
sell_othsh	0.555	0.359	0.123	0.529	0.360	0.142
sell_online	-1.245	1.426	0.382	-1.082	1.431	0.45
sell_exh	1.238	1.060	0.243	1.098	1.092	0.315
sell_exp	0.455	0.355	0.2	0.421	0.359	0.242
subcontract	0.401	0.348	0.249	0.390	0.350	0.265
ornaments	-1.893	2.277	0.406	-2.165	2.343	0.356
calligraphy	3.307	1.244	0.008	3.182	1.253	0.011
dividers	0.617	0.816	0.45	0.707	0.813	0.385
relief	1.032	1.787	0.564	1.141	1.775	0.52
components	1.412	0.985	0.152	1.223	1.111	0.271
basic	1.803	1.481	0.223	2.140	1.678	0.202
finish	0.056	0.436	0.898	-0.006	0.447	0.99
contract	-2.031	0.947	0.032	-1.773	0.942	0.06
broker	0.721	2.028	0.722	0.893	2.085	0.668
Batealit[a]	0.885	0.663	0.182	0.856	0.654	0.191
Jepara[a]	2.056	0.719	0.004	1.969	0.715	0.006
Kedung[a]	0.640	0.748	0.392	0.545	0.746	0.465
Mlonggo[a]	1.016	0.614	0.098	0.960	0.605	0.113
Pakisaji[a]	1.582	0.691	0.022	1.437	0.692	0.038
Tahunan[a]	-0.628	0.648	0.332	-0.713	0.645	0.269
edu_prim	0.637	0.805	0.429	0.668	0.805	0.407
edu_js	2.147	0.829	0.01	2.168	0.832	0.009
edu_ust	1.678	1.194	0.16	1.685	1.194	0.158
edu_usa	2.283	0.839	0.006	2.253	0.842	0.007
edu_high	5.542	1.032	0	5.242	1.046	0
age	0.022	0.020	0.275	0.022	0.020	0.271
no_org	1.942	1.232	0.115	1.968	1.239	0.112

Intercept	-6.186	2.300	0.007	-6.704	2.502	0.007
Obs	534			521		
Pseudo R2	0.341			0.282		

[a] Dummy variable representing location of furniture workshop in a high-density area. The omitted category is workshops outside of city limits (those Kecamatan with low densities of furniture businesses).

Table 3: Profit treatment effects; impacts of membership on 2015 firm profits, several sub-samples

Sample specifications	Treatment Effect, USD	Std. Err.	P-Value
Full (matched) sample	(23,496)	*23,412*	0.32
Excluding firms that brokered in 2015	(8,465)	*13,263*	0.52
Excluding cases that broker or own showrooms in 2015	(11,708)	*21,542*	0.59
Excluding cases with profit above US $80,000	1,213	*2,402*	0.61

Source: 2015 Firm Survey. The treatment effect is the profit in 2015 for APKJ members minus the profits for matched non-members. Standard errors are computed using formulae in Abadai and Imbens (2008) and are explained in StataCorp 2015.

Table 4: Treatment effects of APKJ membership on functional upgrading via adoption and abandonment of marketing and sales channels.

Marketing/Sales Channel	Outcome Variable	Treatment Effect	Standard Error	p-value
Marketing/selling at exhibitions	Added	0.12	0.04	0
	Abandoned	0.03	0.01	0.03
Selling direct to foreign buyers	Added	0.12	0.05	0.02
	Abandoned	0.05	0.03	0.04
Selling direct to domestic buyers	Added	0.12	0.04	0.01
	Abandoned	0.04	0.03	0.16
Selling/marketing online	Added	-0.04	0.07	0.57
	Abandoned	0	0.02	1
Selling to exporters	Added	0.04	0.03	0.16
	Abandoned	0.11	0.04	0.01
Selling through another showroom	Added	-0.03	0.04	0.56
	Abandoned	0.03	0.03	0.39
Selling through (to) brokers	Added	-0.11	0.09	0.25
	Abandoned	0.03	0.04	0.45
Being subcontracted	Added	0.04	0.07	0.58
	Abandoned	-0.01	0.13	0.92
Beginning a brokering activity	Added	0.06	0.03	0.02
	N/A			

Source: 2015 Firm Survey. Differences are between reported behaviour in 2015 and recalled behaviour in 2009. Standard errors are computed using formulae in Abadai and Imbens (2008) and are explained in StataCorp 2015.

Table 5: Treatment effects of APKJ membership on product upgrading activities

Outcome Variable	Treatment Effect	Standard Error	p-value
Binary variable indicating addition of selling finished products between 2009 to 2015: 1 if added ; 0 otherwise	-0.14	0.04	0.00
Binary variable indicating abandoning selling finished products between 2009 to 2015: 1 if added ; 0 otherwise	-0.04	0.05	0.40

Source: 2015 Firm Survey. Differences are between reported behaviour in 2015 and recalled behaviour in 2009. Standard errors are computed using formulae in Abadai and Imbens (2008) and are explained in StataCorp 2015.

Table 6: Treatment effects of business practices on 2015 levels of outcomes

Outcome Variable	Treatment Effect	Standard Error	p-value
SVLK certification in 2015: 1 certified; 0 if not certified	0.08	0.02	0.00
Record-keeping in 2015: 1 if firm keeps records; 0 if firm does not keep records	-0.03	0.03	0.32
Registered business in 2015: 1 if registered; 0 if not registered	0.13	0.08	0.09

Source: 2015 Firm Survey. Standard errors are computed using formulae in Abadai and Imbens (2008) and are explained in StataCorp 2015.

Table 7: Member-identified benefits of the APKJ

|	Claimed Benefits of Membership	Number of APKJ Members
Suggested responses	Training	90
	Credit	8
	Market	15
	Raw Materials	12
	Production	10
Free response	No benefits	15
	Knowledge	34
	Improved Production uality	2
	Gained Friends/Colleagues	12
	Experience	8
	Marketing/Market Access/Exhibition/Opportunities	4
	Borrowed woodworking equipment	2

Source: 2015 Firm Survey of 125 members in APKJ.
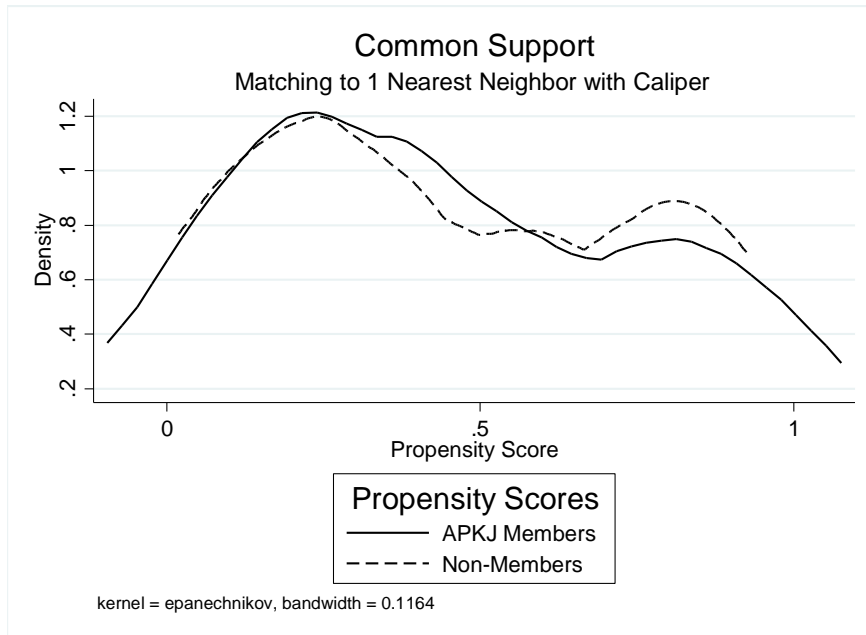
Figure 1: Common support when matching to one nearest neighbour without a caliper
Source: 2015 Firm Survey
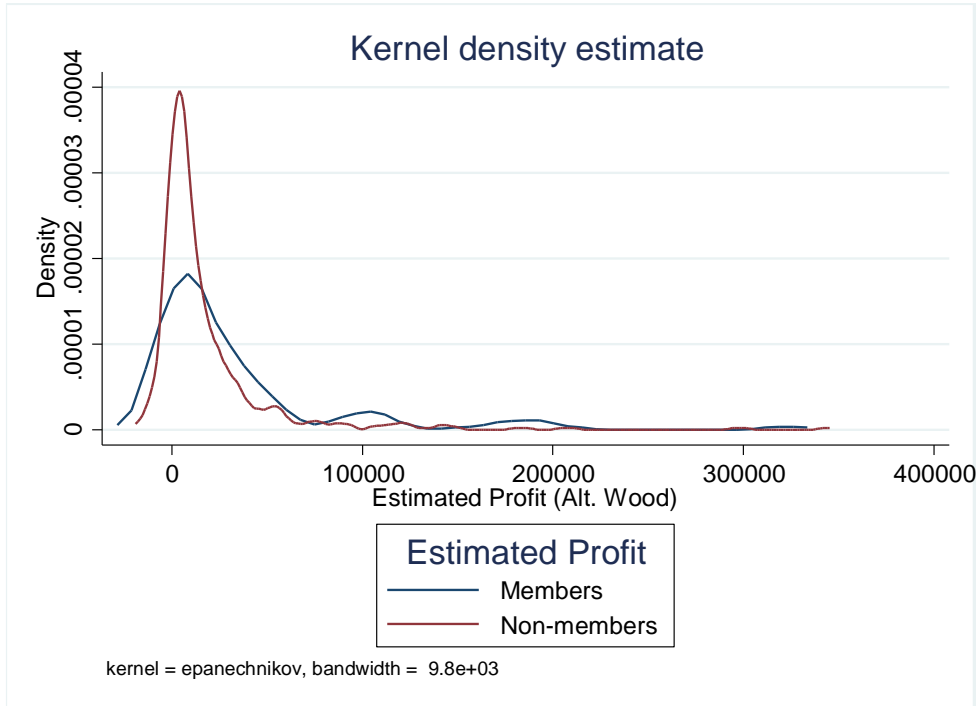
Figure 2: Kernel density of estimated profit for members and non-members before matching
Source: 2015 Firm Survey. Observations: 483
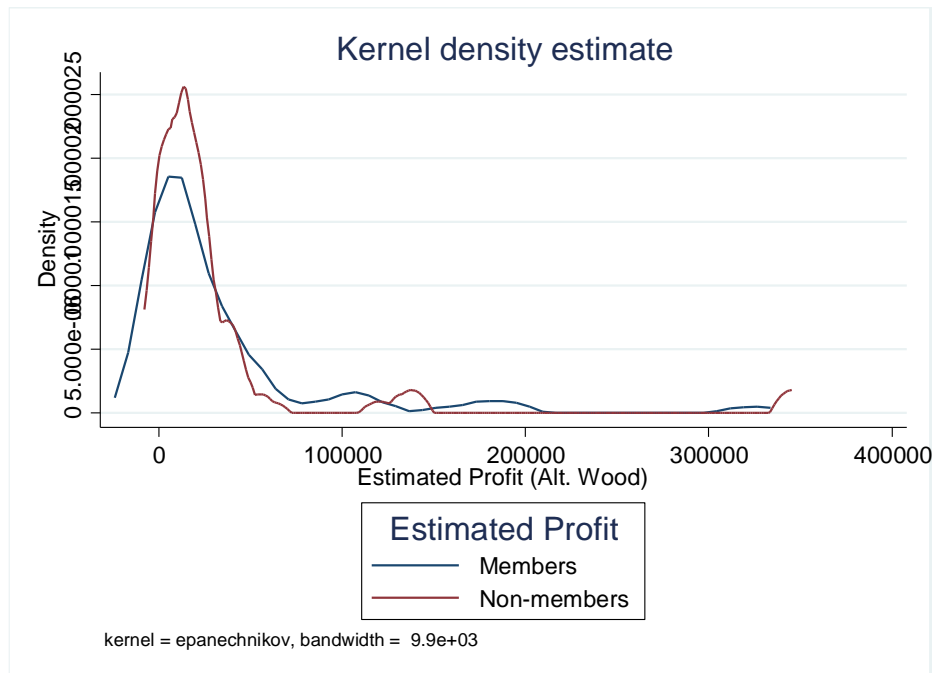
Figure 3: Kernel density of estimated profit after caliper matching to one nearest neighbor

Source: 2015 Firm Survey. Observations: 142

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