Enterprise Performance and the Functional Diversity of Social Capital

Abigail M. Barr

WPS/98-1

June 1998

Centre for the Study of African Economies
Institute of Economics and Statistics
University of Oxford
St. Cross Building
Manor Road
Oxford OX1 3UL

Abstract: Entrepreneurial networks are multifunctional; they can be used to access information about technologies and markets or to reduce uncertainties. A network's function affects its structure and both the magnitude and nature of the impact that it has on enterprise performance. Networks that reduce uncertainty are small and cohesive. They generate positive spillover effects, while having little overall effect on enterprise performance. Networks that provide access to information about technologies and markets are large and diverse. They have a significant effect on enterprise performance, but tend not to generate positive spillovers. Evidence from the Ghanaian manufacturing sector supports these propositions.

Contents

1. Introduction

Social capital in the form of networks of interrelations can enhance the performance of manufacturing enterprises in sub-Saharan Africa, thereby improving both their income generating capacity and their ability to compete. Networks may, however, serve an alternative function: they may help to reduce the uncertainties faced by entrepreneurs in relation to the variability of their incomes. In this paper, I propose that the relative importance of these two objectives to a particular entrepreneur affects the structure of the network she maintains and, as a result, the effect that the network has on the performance of her enterprise. More specifically, where a network is required to assist in the reduction of uncertainty its structure will be such that it has far less impact on enterprise performance, while generating far greater positive spillover effects.

If this proposition holds, when exploring the link between social capital in the form of networks and the performance of enterprises in sub-Saharan Africa, we need to take account not only of levels of networking activity but also the type of networks to which enterprises belong. Data from the Ghanaian manufacturing sector provides evidence to support this proposition and suggests that, while some large enterprises operate within networks ideal for enhancing productivity, the networks to which the more commonplace, small enterprises belong have no significant impact on their performance, having a structure better suited to help cope with income variability.

The paper is divided into five sections. Section 2 contains a brief review of the literature on enterprise networks in developing countries. Section 3 investigates the link between a network's structure and its ability to improve enterprise performance and reduce uncertainty. It also looks at what type of enterprise we might expect to find in each type of network. The empirical results are presented in Section 4. The paper concludes in Section 5 with a brief look at the policy implications arising from the analysis.

2. Enterprise Networks in Developing Countries

In several Asian economies during the seventies and eighties and the industrial districts of Europe and the US, networking has allowed populations of relatively small manufacturing enterprises to contribute to and benefit from economic prosperity based on enhanced worker productivity (Becattini, 1990, Brusco, 1992, Chen and Hamilton, 1992, Piore and Sabel, 1984, Pyke, Becattini and Sengenberger, 1990, Pyke and Sengenberger, 1992, Schmitz, 1992a). The literature on this subject stresses the role that networks play in disseminating information about innovations, lowering transactions costs, increasing the potential for the division of labour between enterprises and fostering collective action. It also stresses the importance of incremental rather than radical changes in technology as a foundation for productivity enhancement.

More recently researchers have asked whether this literature contains lessons relevant to manufacturing sectors in the developing world. In an effort to answer this question they have employed a case study methodology to look at enterprise clusters, i.e., 'group[s] of producers making the same or similar things in close proximity to each other' (Schmitz, 1992b). Case studies have now been conducted in a significant number of developing countries including Brazil (Schmitz, 1995a), Burkina Faso (van Dijk, 1992), Ghana (Dawson, 1992), India (Cawthorn, 1993, Holmström, 1993), Kenya (Livingstone, 1991, Sverrisson, 1992), Mexico (Rabellotti,

1995), Nigeria (Brautigam, 1997), Peru (Villaran, 1993), Tanzania (Aeroe, 1992), Sudan (Hansohm, 1992) and Zimbabwe (Sverrisson, 1992, Rasmussen, 1992). These studies detail the structure, history and functioning of the clusters upon which they focus. In addition, reviews of the literature as a whole have facilitated the identification of more general patterns. They find that, while clustering is commonplace throughout the developing world, well developed networks of interrelations between enterprises and consequent instances of cooperative behaviour are rare (Nadvi and Schmitz, 1994). They also find support for the hypothesis put forward by Schmitz (1989, 1995b), that while clustering can give rise to external economies it is networks and the joint action they facilitate that contributes most to competitiveness. With respect to the functions that networks perform, flows of both technical and market information, equipment sharing and, to a lesser extent, order-sharing are frequently observed. However, highly developed inter-firm divisions of labour, subcontracting and cases where technical information flows have resulted in ongoing technical innovation tend only to be observed in the more advanced clusters of South East Asia and Latin America.

While the case study approach facilitates detailed investigations into the nature of the networks and the linkages of which they are comprised (Schmitz, 1982, Boomgard, Davies, Haggblade and Mead, 1992), it does have its limitations. As Schmitz (1995b) pointed out 'it tends to blunt the search for general principles, broader categories and theorisation' (p. 533). This is aggravated by a tendency on the part of researchers to study clusters that have in some way already made a name for themselves by growing, moving into export markets, innovating or by sustaining a large number of urban poor through a time of crisis. The aim of this paper is to identify general patterns linking enterprise type and network function, structure and effect. For this purpose cross-section analysis based on a sample of enterprises drawn from an entire manufacturing sector is more appropriate. Such an approach has already provided evidence of the role that networks play in the determination of suppliers credit (Fafchamps, 1996a) and the determination of enterprise performance and growth potential (Barr, 1997).

3. Networking to Improve Enterprise Performance and Reduce Uncertainty

Networks can affect enterprise performance directly by providing entrepreneurs with information about the world, especially about technologies and markets. Increases in the amount of technical information available to a workforce will have a direct effect on its productivity. Information about output markets, how they function and the standards to which they comply, may help enterprises become more competitive and may also have a direct effect on productivity, especially if an enterprise is operating below full capacity. Finally, increased access to information about input markets may reduce costs or improve output quality.

An entrepreneur whose networking objective is to maximize access to such information will wish to be part of a far reaching network. She will face high returns to maintaining a large, diverse set of contacts. She may also benefit from maintaining contacts who themselves maintain large and diverse sets of contacts as, *ceteris paribus*, they will be better informed. However, this positive spillover effect will be offset by the benefits that follow from being better informed than anyone else. *Ceteris paribus*, an entrepreneur will be better informed than anyone else the higher the level of networking she undertakes herself and the lower the level of networking undertaken by others. Networks may improve entrepreneurs' access to information about the world even when their

primary function is to reduce uncertainty. However, where uncertainty reduction is paramount the ability of the network to act as a conduit for information about technologies and markets may be compromised.

Much of the uncertainty facing enterprises in sub-Saharan Africa is due to a lack of contract discipline, leading in turn to delayed supplies, unreliable quality, and late payments and repayments by customers and debtors. However, as Fafchamps (1996) explains, these problems are 'less the consequence of opportunism and carelessness than of poverty and unanticipated income fluctuations. Shortages of critical inputs, delays in payment by their own customers, and difficulties in transport render firms unable to pay on time or to deliver the quantity and quality promised. Poor contractual performance tends to ripple through the system' (p. 428). In such an environment entrepreneurs need to be flexible when dealing with trading partners, creditors and debtors. However, they also need to be able to distinguish between unavoidable poor contractual performance and poor contractual performance due to incompetence or malfeasance. The problem here is one of information asymmetries that can lead to high, unavoidable transaction costs Platteau (1994a, 1994b). In more developed countries a plethora of formal market-supporting institutions have emerged that, in combination with general trends in development, have reduced uncertainties, improved contract discipline, and lowered both information asymmetries and the resulting transactions costs. In sub-Saharan Africa, while many similar institutions exist, they tend not to permeate the environment within which most enterprises operate. Instead, entrepreneurs rely on their networks to reduce information asymmetries by facilitating flows of information about the previous conduct, current circumstances and future intensions of their trading partners, debtors and creditors (Fafchamps, 1996b). Hence, these networks provide a basis for trade, credit and insurance.

Credit and insurance are very important in environments characterized by high levels of uncertainty, and yet the markets for these services are among those most severely affected by poor contract discipline and information asymmetries. It is in these markets that we most readily observe differences in the institutional environments within which different types of African enterprise operate. Formal lines of credit are available, but only to those with collateral, i.e., those who already have accumulated assets and who operate in an environment characterised by well defined property rights. Formal insurance also requires that property rights be well defined. Informal credit and insurance arrangements can work in the absence of formal institutions such as well defined property rights, but are just as vulnerable to problems of information asymmetry as their formal counterparts (Udry, 1994). However, unlike those formal counterparts, informal arrangements can be supported by networks (Fafchamps, 1992).

Having established that networks can help substitute for formal market-supporting institutions by allowing information about agents to flow, I wish to argue that in order to fulfil this role they need to assume a particular structure. *Ceteris paribus*, risk-sharing and informal credit arrangements are more efficient the larger and more diverse the group (Alderman and Paxson, 1994). This notwithstanding, as the group and hence the network increases in size, so too does the number of agents about whom each member has to keep informed. At some finite network size it is likely that the costs associated with the need to assimilate information about an additional network

member will outweigh the benefits.[1] Increasing the diversity of the network also increases the cost of collecting the required information. This is because it becomes harder for each member to establish the standing of others based on the observations she can make. If diversity relates to geographical location it is the cost of observing that increases. If diversity relates to activity the problem is one of interpretation. It is for these reasons that Posner (1980) expects sharing arrangements to be confined to groups of people with 'broadly similar abilities, propensities, character, and prospects' (p. 12). Posner also emphasises the need for continual interaction if information asymmetries are to be effectively reduced. This need may further suppress the optimal size and diversity of the network, as time constraints will lead to a tradeoff between these dimensions and the level of interaction with each contact.

Table 1: Network Function, Structure and Effect on Enterprise Performance

	Innovation Network	**Solidarity Network**
Network function	to enhance enterprise performance	to reduce uncertainty
Type of information flowing through the network	about the world, about technologies and markets	about member's conduct, circumstances and intensions
Characteristics of the sets of contacts maintained by network members	large, diverse, relatively infrequent interaction with each contact	small, homogeneous, high levels of interaction with each contact
Overall effect on current enterprise performance	relatively large	relatively small
Return on own networking activity	a high proportion of the overall effect	a low proportion of the overall effect
Spillover effects of networking	a low proportion of the overall effect	a high proportion of overall effect
Typical member enterprise	larger enterprises with access to formal institutions	smaller enterprises with no access to formal institutions

A network ideally suited to reducing uncertainty is significantly different from one that provides a high degree of access to information about the world. An uncertainty reducing network may enhance enterprise performance indirectly. Lower levels of uncertainty have been linked with higher levels of investment (Pattillo, 1997), while informal credit arrangements can be used to overcome capital constraints. However, in general we would expect such a network to have a positive effect on welfare, while having little or no effect on enterprise performance. This is primarily because of the way in which the need to rely on networks to reduce uncertainty affects the relative importance of the private and spillover effects of networking. A network is useful in the context of uncertainty reduction because it makes it hard to keep secrets. But if members are

[1] Milgrom, North and Weingast (1990) and Grief (1993) use game theory to draw similar conclusions.

unable to keep secrets about themselves, they will also find it difficult to keep secrets about technological and market developments. Hence, the greater the extent to which a network is required to reduce uncertainty, the greater the importance of spillovers in the overall impact of the network on enterprise performance. Further, the members of this type of network may have difficulty excluding others from the returns relating not only to their networking activity but to many other activities including investments in physical capital and all forms of innovation. This may act as a disincentive, making it less likely that the members of such networks will take steps to improve the current and future performance of their enterprises (Posner, 1980).

The preceding discussion about the best types of network for enhancing enterprise performance and reducing uncertainty is summarized in Table 1. Here, networks that enhance enterprise performance by allowing information about the world to flow between their members have been labelled 'innovation networks'. While those designed to reduce uncertainty by allowing information about agents to flow have been labelled 'solidarity networks' (Fafchamps, 1992). The final row of the table indicates the type of enterprises that we are most likely to find in the two forms of network. In innovation networks we are likely to find larger enterprises as they tend to operate within environments at least partially regulated by formal, market-supporting institutions and have access to formal lines of credit and insurance. Larger enterprises, as well as having less to loose, may also have more to gain from maintaining innovation rather than a solidarity networks as they employ rapidly evolving technologies and serve a potentially diverse set of markets. In solidarity networks we are more likely to find enterprises that have restricted access to and operate within an environment unregulated by formal, market-supporting institutions, who employ traditional, static technologies and sell primarily to end users in local markets. Smaller enterprises generally display these characteristics.

4. Empirical Analysis

We can investigate the theoretical linkages in Table 1 using data from the Ghanaian manufacturing sector. Much of the data required to conduct this investigation can be drawn from the Ghanaian Regional Program for Enterprise Development (RPED) survey and its successor, the Ghanaian Manufacturing Enterprise Survey (GMES).[2] While these surveys contain a wide range of data about manufacturing enterprises, their employees and the environment in which they operate, the original questionnaire did not address the issue of enterprise networks. To remedy this the author designed a supplementary questionnaire that was administered first in 1994 and again in 1996. Due to the absence of a good frame the sample of enterprises cannot be described as random. Larger enterprises are known to be over-represented, while small and micro enterprises are significantly under-represented. As a result we need to be cautious when drawing conclusions from the data about the Ghanaian manufacturing sector as a whole. This notwithstanding, the data is ideal for making comparisons between different types of enterprise.

In the supplementary networking questionnaire the respondents were asked how many contacts

[2] Both surveys were funded by the British Government. The RPED was a World Bank project under which the Centre for the Study of African Economies (CSAE), University of Oxford, and the Department of Economics, University of Legon, conducted the Ghanaian survey. The GMES was conducted by the CSAE and the Ghanaian Statistical Service.

they maintained in each of nine categories. Six of these related to other businesspeople in the same line of business, in different lines of business, with larger businesses, in other regions of Ghana, non-Ghanaians based in Ghana, and in other countries. The remaining three related to bankers, public servants, and politicians. In the following analysis the networking activity of each entrepreneur is captured by the number of contacts they purport to maintain.[3] The questionnaire design also facilitated the construction of a variable relating to the networking activity of the respondents' co-networkers. Starting with the entire sample of enterprises, for each respondent, a sub-sample corresponding to the description of her contacts is drawn. The average number of contacts maintained by this sub-sample is then used as a proxy for the level of networking undertaken by each respondent's co-networkers. The inclusion of this variable in the analysis allows us to separate the private from the spillover effects of networking. To identify the type of network to which each entrepreneur belongs we use three variables: the diversity of their contacts, defined as the number of categories within which they have at least one contact; the average frequency of liaison between the entrepreneur and her contacts (available only for a sub-sample); and the proportion of her contacts that an entrepreneur expects would help her in a crisis (available only for a sub-sample).

The characteristics of small enterprises (up to thirty employees) and large enterprises (more than thirty employees), with particular reference to their institutional environments, markets, technologies and networks, are presented in Table 2. The only information we have on the institutional environment within which the enterprises operate relates to whether they use formal sources of credit and insurance — small enterprises are significantly less likely to use formal sources of credit or to formally insure their capital stock. Our best indicator of potential market diversity relates to actual market diversity — small enterprises are far more likely to supply only end users. In production, small enterprises employ relatively labour-intensive technologies and are less likely to use electrically powered tools. In addition, their workforces are significantly less educated and experienced. All of these indicators suggest that small enterprises have less to gain and more to loose from maintaining large, diverse innovation networks. We would expect them to build the type of networks that can substitute for formal market-supporting institutions and help them cope with potential information asymmetries, i.e., relatively small, homogeneous and cohesive solidarity networks. In contrast, larger enterprises have reasonable access to formal institutions and may have more to gain from large, diverse innovation networks. The third part of Table 2 contains several indicators relating to the types of networks that small and large enterprises maintain. In line with our expectations, small enterprises maintain only one third of the contacts maintained by larger enterprises and liaise far more frequently (more than twice rather than less than once a week) with each. As well as being smaller, their networks are less diverse and are made up of co-networkers who also maintain small networks. Finally, they expect that a greater (although not significantly greater) proportion of their contacts will assist them in a crisis.

[3] In order to maximize the sample size corporate enterprises were not excluded. In these cases the managing director was the respondent to the network module of the questionnaire.

Table 2: Characteristics of small and large enterprises and their networks[a]

	1 - 30 employees	> 30 employees	Significance of difference	All enterprises
Institutional Environment				
Percentage of enterprises with a formal loan or overdraft	17.78%	75.00%	***	32.79%
Percentage of enterprises that insure their capital stock[#]	0.88%	64.29%	***	25.00%
Markets and Technologies				
Percentage of enterprises supplying to end users only	41.11%	18.75%	**	35.25%
Mean capital-labour ratio	1,861	6,078	***	2,967
Percentage of enterprises using electrically powered tools	62.22%	90.63%	***	69.67%
Mean years of formal education of workforce	9.06	11.00	***	9.57
Mean years of work experience of workforce	5.20	10.05	***	6.47
Networks				
Mean number of contacts	33.48	92.41	**	48.93
Mean diversity of contacts	3.53	5.91	***	4.16
Mean number of liaisons with an average contact per year[#]	107.82	50.17	***	93.04
Mean number of contacts of the entrepreneurs' co-networkers	38.57	63.03	***	44.98
Percentage of contacts who would assist in a crisis[#]	23.20%	14.12%		21.95%
Number of enterprises[#]	90	32		122

[a] The table is constructed using 1993 data. The capital-labour ratio is reported in thousands of Cedi.
** Means significantly different at 5% level.
*** Means significantly different at 1% level.
# Insurance variable available for 68 small and 28 large enterprises, liaisons variable available for 87 small and 30 large enterprise, assistance in a crisis variable available for 63 small and 10 large enterprises.

We can learn more about what motivates different entrepreneurs to build different types of networks by introducing the variables in Table 2 into a set of simple regressions that take contact diversity, frequency of liaison and the expectation of help in a crisis as their dependent variables. The results of these regressions, which have been conducted using ordinary least squares should be thought of as correlations rather than estimates of fully specified models of network determination. This is particularly important when looking at the coefficients on our two

indicators relating to the use of formal market-supporting institutions. Our theory identifies formal institutions and solidarity networks as substitutes: it follows that network structure and the use of formal institutions are simultaneously determined.

Table 3: Regression analysis of network characteristics[a]

Dependent Variable	Diversity of contacts	Frequency of liaison	Proportion of contacts who would help in a crisis
Constant	2.3832*** (0.52)	99.1400*** (18.24)	0.2893*** (0.06)
Number of employees	0.0043** (0.002)	- 0.1630** (0.07)	- 0.0005 (0.001)
Formal loan or overdraft	0.7146** (0.33)	- 47.5000*** (10.19)	- 0.1130*** (0.03)
Formally insure capital	1.6271*** (0.32)	- 0.5327 (14.50)	0.0544 (0.06)
Supply end users only	0.0013*** (0.0004)	- 0.0196 (0.03)	- 0.0001** (0.00003)
Capital-labour ratio (millions of Cedi / worker)	0.0624*** (0.01)	- 0.2728 (0.73)	- 0.0026** (0.001)
Electrically powered tools	0.4439* (0.23)	- 13.5020 (9.81)	- 0.0923*** (0.03)
Mean years of formal education of workforce	0.0696 (0.05)	1.7794 (1.44)	- 0.0028 (0.006)
Mean years of work experience of workforce	-0.0371*** (0.01)	0.7758 (0.67)	0.0030 (0.003)
Number of observations	411	381	271
Adjusted R^2	0.3287	0.0788	0.0580

[a] Numbers in parentheses are heteroscedasticity-consistent standard errors. All regressions contain three year dummies.
* Significant at 10% level.
** Significant at 5% level.
*** Significant at 1% level.

The high probability of simultaneity bias notwithstanding, the results of the regression analysis are revealing. The number of employees is included in the regressions primarily as a control variable. However, it is interesting to note that large enterprises tend to have more diverse sets of contacts and liaise less frequently with each. It is also interesting to note that after controlling for institutional environment, market diversity and technology, enterprise size and the proportion of her contacts from whom an entrepreneur expects help are uncorrelated. Entrepreneurs who use formal sources of credit are likely to have significantly more diverse sets of contacts, to liaise significantly less often with each contact, and to expect a significantly lower proportion of their contacts to help them in a time of crisis. Entrepreneurs who formally insure their capital stocks are also likely to have more diverse sets of contacts. However, there is no significant correlation

between the use of formal insurance and the other two indicators of network type. This may be due to the high degree of collinearity among the right hand side variables. The results relating to whether entrepreneurs supply only end users are not in line with our expectations. Those supplying only end users are likely to have more diverse sets of contacts and to expect a lower proportion of them to help in a crisis. These results may be reflecting the difference between potential and actual market diversity. It may be that entrepreneurs choose to supply only end users as an alternative uncertainty reducing strategy. End users tend to buy from existing stock or to place only small orders and they generally pay cash prior to or on delivery. By avoiding problems relating to information asymmetries in this way entrepreneurs may reduce their need to rely on solidarity networks. Turning to our technological indicators we find that more capital intensive enterprises have significantly more diverse sets of contacts a lower proportion of whom they expect to help them in a crisis. The results relating to the use of electrically powered tools are similar. After controlling for these two technological indicators the level of worker education is not significant, while worker experience is significantly correlated with only the diversity of contacts. Contrary to our expectations, this correlation is negative. This may be because entrepreneurs treat experienced workers and networks as substitutes, but is more likely to be a symptom of collinearity.

By estimating several fully specified productivity equations we can investigate whether there is a link between network type and the effect of networking on enterprise performance. The productivity equations are estimated using a sample pooled over the four years from 1992 to 1995 and take value-added per worker as their dependent variable. To isolate the effect of networks we must control for several other factors including the number of employees, the capital-labour ratio, and the years of formal education and work experience of an average employee. The equations also include a dummy for corporate enterprises, three annual dummies and five sub-sectoral dummies. Networking activity is captured by the number of contacts maintained by the entrepreneur and the average number of contacts maintained by her co-networkers. In order to look at whether the effects of networking vary depending on the type of network we introduce six interaction terms into the regression equations. These take the two base networking variables and multiply them by each of our three indicators of network type, contact diversity, frequency of liaison and expectations of help. All of the regressions are conducted using ordinary least squares, as there is a dearth of good, valid instrumental variables in the RPED data set. So, once again we must be aware of the possibility of simultaneity bias in the estimated coefficients on the right-hand side variables.

Let us look first at the results relating to labour and physical and human capital. The coefficient relating to the number of employees is insignificant in all of the estimated equations indicating that the returns to scale on labour and physical capital are constant. The coefficient relating to the capital-labour ratio and the human capital variables remain stable following the introduction of the various network variables, except in the final column where the change in sample causes some variation. A one percent increase in the amount of capital per worker corresponds to a 0.14 to 0.18 percent increase in productivity. The effects of worker education and experience on productivity are non-linear. The marginal returns to worker education increase, while the marginal returns to worker experience diminish.

Table 4: Estimated productivity equations[a]

	No network variables	Network effects assumed the same for all network types	Network effects assumed to differ between network types	
			(a)	(b)
Constant	10.4890***	10.1690***	10.6860***	10.6760***
	(0.44)	(0.46)	(0.46)	(0.65)
Ln (number of employees)	0.0247	- 0.0396	- 0.0428	- 0.1274
	(0.06)	(0.07)	(0.07)	(0.10)
Ln (capital-labour ratio)	0.1854***	0.1746***	0.1648***	0.1376***
	(0.04)	(0.04)	(0.04)	(0.05)
Average years of education	- 0.2116***	- 0.1838***	- 0.1795***	- 0.0637
	(0.06)	(0.06)	(0.06)	(0.08)
Square of years of education	0.0144***	0.0122***	0.0117***	0.0023
	(0.004)	(0.004)	(0.004)	(0.005)
Average years of experience	0.0517***	0.0557***	0.0464**	0.0442**
	(0.02)	(0.02)	(0.02)	(0.02)
Square of years of experience	- 0.0012***	- 0.0012***	- 0.0010**	- 0.0010**
	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Ln (own networking)	----	0.0891**	- 0.2052**	- 0.0443
		(0.05)	(0.09)	(0.16)
Ln (others' networking)	----	0.0840	0.1730**	0.1260
		(0.06)	(0.08)	(0.12)
Contact diversity × Ln (own networking)	----	----	0.0548***	0.0596***
			(0.02)	(0.02)
Contact diversity × Ln(others' networking)	----	----	- 0.0330**	- 0.0415**
			(0.02)	(0.02)
Frequency of liaison × Ln (own networking)	----	----	----	- 0.0013**
				(0.0005)
Frequency of liaison × Ln(others' networking)	----	----	----	0.0012***
				(0.0004)
Help in a crisis × Ln (own networking)	----	----	----	- 0.2335
				(0.25)
Help in a crisis × Ln(others' networking)	----	----	----	0.2732*
				(0.16)
Number of observations	494	494	494	306
Adjusted R^2	0.3351	0.3541	0.3629	0.2859

[a] Numbers in parentheses are heteroscedasticity-consistent standard errors. All regressions contain three year dummies, a dummy for corporate enterprises, and five sectoral dummies.

* Significant at 10% level. ** Significant at 5% level. *** Significant at 1% level.

The equation in the second column has been estimated under the assumption that the effects of networking are the same within all types of network. It reveals that, on average, enterprises benefit from their own networking activity. The coefficient on this variable is significant at the five percent level and suggests that a one percent increase in the number of contacts an entrepreneur maintains corresponds to a 0.09 percent increase in productivity. The coefficient relating to the networking activity of the entrepreneur's co-networkers is positive but poorly defined. The results in the third and fourth columns indicate that this is because nature of the spillover effects varies significantly depending on the type of network an entrepreneur maintains.

Two equations have been estimated that take account of variations in the effects of different types of network. In the first, (a), only contact diversity is used to capture different types of network. This regression shows that the effects of increasing numbers of contacts maintained vary depending on how diverse the contacts are. When an entrepreneur's contacts are more diverse the effect of her increasing the number of contacts she maintains will be larger, while the effect of her co-networkers increasing the number of contacts they maintain will be smaller, i.e., the more diverse the network the larger the private effect and the smaller the spillover effects of networking. These results are confirmed by the equation in the final column. In this equation the frequency of liaison and the expectation of help are also taken into account, even though this severely reduces the size of the sample with which we can work (from 494 to 306 observations). In spite of the high degree of collinearity between them, five out of the six resulting interaction terms are significant. As before, increases in contact diversity are associated with increases in the private and declines in the spillover effects of networking. Increases in both the frequency of liaison and the expectation of help are associated with declines in the private and increases in the spillover effects of networking.

The economic significance of these interaction effects is best demonstrated by calculating the private and spillover effects of networking for different types of network and enterprise. We have characterized a solidarity network as small and homogeneous with a high level of interaction and the capacity to support informal risk-sharing arrangements, while an innovation network is large and diverse with a low level of interaction and no capacity to support such arrangements. Now, we need to assign a particular level of diversity, frequency of liaison and expectation of help to each. To avoid being totally arbitrary, I shall define a solidarity-type network as one in which the diversity of contacts is one standard deviation below its mean (1.67) and the frequency of liaison and expectation of help are both one standard deviation above their means (182.23 and 0.49 respectively). By the same logic, an innovation-type network is defined as one in which the diversity of contacts is one standard deviation above its mean (6.64) and the frequency of liaison and expectation of help are both one standard deviation below their means (3.85 and zero respectively). We can then calculated the private, spillover and overall effects of networking within the two types of network.

The results of this exercise are presented in the first two columns of Table 5. Each of the numbers presented is an elasticity. The 'private effect' indicates the percentage rise in the productivity of an entrepreneur's workforce corresponding to a one percent increase in the number of contacts she maintains. The 'spillover effects' indicate the percentage rise in the productivity of an entrepreneur's workforce corresponding to a one percent increase in the number of contacts her co-networkers maintain. The 'overall effect' indicates the percentage rise in productivity corresponding to a one percent increase in both the number of contacts maintained by the

entrepreneur and her co-networkers. The pattern of effects across the two types of network conforms closely to our expectations. Note first that while the overall effect of networking is positive within both network types, within the solidarity-type network it is half the size and not significantly different from zero. Looking at the breakdown of the overall effect into the private and spillover effects we find that in the innovation-type network the private effect is positive and high (approximately two times the effect of increasing physical capital by a corresponding amount), while the spillover effects are not significantly different from zero. In contrast, in the solidarity-type network the spillover effects are both high and significantly different from zero, while the private effect is significantly negative. This negative private effect can be explained by pointing out that we have not controlled for the cost of networking in the estimated productivity equations. In the absence of such a control, the private effect of networking is estimated net of costs. The negative private effect implies that the costs of networking outweigh the private benefits.

Table 5: The private and spillover effects of networking in different types of network

	Innovation-type network	Solidarity-type network	Average large enterprise	Average small enterprise
Private effect	0.3466***	- 0.3015**	0.2086**	- 0.0312
Spillover effects	- 0.1448	0.4021***	- 0.0223	0.1680**
Overall effect	0.2018**	0.1006	0.1863**	0.1368

** Significant at 5% level.
*** Significant at 1% level.

The last two columns of Table 5 report the results of another set of calculations in which the diversity of contacts, the frequency of liaison and the expectation of help are set at the averages reported for small and large enterprises in Table 2. As a result of this exercise we see that because of the type of networks they build, the overall effect of networking activity on large enterprises is positive and significant, while the corresponding effect on small enterprises is not significantly different from zero. The private effect of networking is positive and significant for large enterprises, but again not significantly different from zero for small enterprises. In contrast, it is only the small enterprises that benefit from significant positive spillover effects.

5. Conclusions

The results of the empirical analysis are consistent with the proposition that networks affect enterprise performance in different ways and to different extents depending on the function they are built to perform. These differences arise because alternative network structures suit alternative functions. Entrepreneurs with larger enterprises tend to maintain innovation networks that are large, diverse, less cohesive and best suited to providing access to information about technology and markets. In contrast, entrepreneurs with smaller enterprises tend to maintain solidarity networks that are small, homogeneous, cohesive and best suited to reducing information asymmetries and thus supporting informal credit and risk-sharing arrangements. While these solidarity networks may have a marginal effect on enterprise productivity, it is the more far-reaching, innovation networks that have a large and significant impact. It is not only the overall

effect of networking that varies, the nature and relative importance of the private and spillover effects also depend on the role and consequent structure of the network. Solidarity networks tend to generate significant positive spillovers; within their bounds it is difficult for individuals to exclude others from the benefits of their own networking activity. On the other hand, the innovation networks to which large enterprises belong tend to generate high private returns. While compelling, these results must be viewed with some caution. Due to data constraints, we have not been able to rule out the possibility of simultaneity bias.

Policy makers are becoming increasingly interested in the concept of social capital. The results presented in this paper suggest that caution needs to be exercised in this area. Traditionally, spillover effects have been viewed as a rationale for policy intervention, with positive spillovers being taken a sign that some form of subsidy or fostering intervention is in order. Above, we found evidence of positive spillovers only within the solidarity networks built by smaller enterprises. However, encouraging networking of this type, while improving entrepreneurs' ability to cope with uncertainty, may lead to the suppression of innovative activity. In addition, for other types of enterprise with different networking objectives we cannot rule out the possibility of negative spillover effects relating to networking activities. Given that the overall effect of networking on enterprise performance is significant only in innovation networks we might be tempted to encourage all enterprises to expand and diversify their sets of contacts. This, however, could leave many enterprises more vulnerable to the effects of uncertainty, as it could compromise their networks' ability to reduce information asymmetries and support informal credit and risk-sharing arrangements. Efforts to strengthen formal market-supporting institutions and make them more accessible to small enterprises might be a more fruitful policy objective. Future research into the role of social capital in the form of enterprise networks in determining economic outcomes may suggest appropriate policy interventions, but at present our overriding aim should be to do no harm.

References

Aeroe, A., 1992, New Pathways to Industrialization in Tanzania: Theoretical and Strategic Considerations, IDS Bulletin 23(3).

Alderman, H. and C. H. Paxson, 1994, Do the Poor Insure? A Synthesis of the Literature on Risk and Consumption in Developing Countries, in: E. L. Bacha, ed., Economics in a changing world: Proceedings of the Tenth World Congress of the International Economic Association. International Economic Association, London.

Barr, A. M., 1997, Social Capital and Technical Information Flows in the Ghanaian Manufacturing Sector, Mimeo, Centre for the Study of African Economies, University of Oxford.

Becattini, G., 1990, The Marshallian Industrial District as a Socio-Economic Notion, in: F. Pyke, G. Becattini and W. Sengenberger, eds., Industrial Districts and Inter-Firm Co-operation in Italy. International Labour Organisation, Geneva.

Boomgard, J. J., S. P. Davies, S. J. Haggblade and D. C. Mead, 1992, A Subsector Approach to Small Enterprise Promotion and Research, World Development 20(2).

Brautigam, D., 1997, Substituting for the State: Institutions and Industrial Development in Eastern Nigeria, World Development 25(7).

Brusco, S., 1990, The Idea of the Industrial District: Its Genesis, in: F. Pyke, G. Becattini and W. Sengenberger, eds., Industrial Districs and Inter-Firm Co-operation in Italy. International Labour Organisation, Geneva.

Cawthorn, P., 1993, The Labour Process Under Amoebic Capitalism: A Case Study of the Garment Industry in a South Indian Town, in: I. S. A. Baud and G. A. De Bruijne, eds.,, Gender, Small-Scale Industry and Development Policy. Intermediate Technology, London.

Chen, E. and G. G. Hamilton, 1991, Introduction: Business Groups and Economic Development, in: G. G. Hamilton, ed., Business Networks and Economic Development in East and South East Asia. University of Hong Kong, Hong Kong.

Dawson, J., 1992, The Relevance of the Flexible Specialization Paradigm for Small-scale Industrial Restructuring in Ghana, IDS Bulletin 23(3).

van Dijk, M.P., 1992, How Relevant is Flexible Specialization in Burkina Faso's Informal Sector and Formal Manufacturing Sector?, IDS Bulletin 23(3).

Fafchamps, M., 1992, Solidarity Networks in Preindustrial Societies: Rational Peasants with a Moral Economy, Economic Development and Cultural Change 41(1)

Fafchamps, M., 1996a, Ethnicity and Markets: Suppliers Credit in African Manufacturing, Stanford University Working Paper, wopstanec 96013.

Fafchamps, M., 1996b, Market Emergence, Trust, and Reputation, Stanford University Working Paper, wopstanec 96016.

Greif, A., 1993, Contract Enforceability and Economic Institutions in Early Trade: The Maghribi Traders, American Economic Review83(3).

Hansohm, D., 1992, Small Enterprise Flexibility in Sudan, IDS Bulletin 23(3). Holmström, M., 1993, Flexible Specialization in India?, Economic and Political Weekly, 28 August.

Livingstone, I., 1991, A Reassessment of Kenya's Rural and Urban Informal Sector, World Development 19(6).

Milgrom, P. R., D. C. North and B. R. Weingast, 1990, The Role of Institutions in the Revival of Trade: The Law Merchant, Private Judges, and the Champagne Fairs, Economics and Politics 2(1).

Nadvi, K. and H. Schmitz, 1994, Industrial Clusters in Less Developed Countries: Review of

Experiences and Research Agenda, IDS Disscussion Paper, No. 339.
Piore, M. J. and C. F. Sabel, 1984. The Second Industrial Divide, Possibilities for Prosperity, Basic Books, New York.
Pattillo, C., 1997, The Impact of Uncertainty on the Investment Behaviour of Ghanaian Manufacturing Sector Firms, in: P. Collier and C. Pattillo(eds) Risk and Agencies of Restraint: Reducing the Risks of African Investment. Macmillan, London.
Platteau, J. P., 1994a, Behind the Market Stage Where Real Societies Exist - Part I: The Role of Public and Private Order Institutions, Journal of Development Studies 30(3).
Platteau, J. P., 1994b, Behind the Market Stage Where Real Societies Exist - Part II: The Role of Moral Norms, Journal of Development Studies 30(3).
Posner, R. A., 1980, A Theory of Primitive Society, With Special Reference to Law,Journal of Law and Economics 23.
Pyke, F., G. Becattini and W. Sengenberger, 1990. Industrial Districts and Inter-firm Co-operation in Italy. International Labour Organisation, Geneva.
Pyke, F., and W. Sengenberger, 1992. Industrial Districts and Local Economic Regeneration. International Labour Organisation, Geneva.
Rabellotti, R., 1995, Is there an “Industrial District Model”? Footwear Districts in Italy and Mexico Compared, World Development 23(1).
Rasmussen, J., 1992, The Small Enterprise Environment in Zimbabwe: Growing in the Shadow of Large Enterprise, IDS Bulletin 23(3).
Schmitz, H., 1982, Growth Constraints on Small-scale Manufacturing in Developing Countries: A Critical Review, World Development 10(6).
Schmitz, H., 1989, Flexible Specialization - A New Paradigm of Small-Scale Industrialization?, IDS Discussion Paper, No. 261.
Schmitz, H., 1992a, Industrial Districts: Model and Reality in Baden-Wurttemberg, Germany, In F. Pyke and W. Sengenberger, eds., Industrial Districts and Local Economic Regeneration. International Labour Organisation, Geneva.
Schmitz, H., 1992b, On the Clustering of Small Firms, IDS Bulletin 23(3).
Schmitz, H., 1995a, Small Shoemakers and Fordist Giants: Tale of a Supercluster, World Development 23(1).
Schmitz, H., 1995b, Collective Efficiency: Growth Path for Small-Scale Industry, Journal of Development Studies 31(4).
Sverrisson, A., 1992, Flexible Specialization and Woodworking Enterprises in Kenya and Zimbabwe, IDS Bulletin 23(3).
Udry, C., 1994, Risk and Insurance in a Rural Credit Market: An Empirical Investigation in Northern Nigeria, Review of Economic Studies 61.
Villaran, F., 1993, Small-scale industry efficiency groups in Peru, in: B. Späth, ed., Small Firms and Development in Latin America: The Role of Institutional Environment, Human Resources and Industrial Relations. International Labour Organization, Geneva.