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Janneke Pieters, Ana I. Moreno-Monroy, and Abdul A. Erumban

For additional information please contact:

Name: Janneke Pieters

Affiliation: University of Groningen

Email address: [janneke.pieters@rug.nl](mailto:janneke.pieters@rug.nl)

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# **Formal-informal linkages and informal sector dynamics: evidence from India**

Janneke Pieters, Ana I. Moreno-Monroy, Abdul A. Erumban

Groningen Growth and Development Centre, University of Groningen

[janneke.pieters@rug.nl](mailto:janneke.pieters@rug.nl) [www.rug.nl/staff/janneke.pieters](http://www.rug.nl/staff/janneke.pieters)

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## **Abstract**

In this paper we analyze the formal-informal sector relationship, distinguishing a traditional and a modern informal subsector. Based on existing literature, we argue that modern informal firms have a forward production links with formal firms, while traditional informal firms do not. We show that in Indian manufacturing, growth and competitiveness in the formal sector benefits the modern informal sector, in line with this production linkage. The link does not exist for the traditional informal sector. Our results emphasize the importance of accounting for informal sector heterogeneity when analyzing the formal-informal relationship, and when designing appropriate policies.

Keywords: Informal sector, formal-informal linkages, manufacturing, India

## **1. Introduction**

In developing countries, the informal sector accounts for 50 to 80 per cent of employment and 20 to 40 per cent of output (ILO and WTO, 2009). An essential feature of the informal sector is its diversity: the informal sector covers not only traditional activities such as street vending, but also more modern and more profitable enterprises that use capital and hired labor (House, 1984; Fields, 1990; Ranis and Stewart, 1999).

Given this heterogeneity, a relevant question for understanding the size and growth of the informal sector is how different segments of the informal sector relate to the formal sector. Ranis and Stewart (1999) analyze the informal sector relation to the rest of the economy, dividing the urban informal sector into a traditional and a modern subsector. The traditional informal sector is a free-entry sector with low capitalization, low labor

productivity, small size, and static technology. Modern informal activity is more capital-intensive, larger in size, uses more dynamic technology and skilled labor, and can generate substantial entrepreneurial incomes. On the consumer market, the modern informal firms compete with formal firms, while traditional informal firms supply a different segment of (low income) consumers. On the producer market the modern informal and formal sectors are complementary, as modern informal intermediates may be used in formal sector production. Modern informal firms may also undertake part of the production process of formal firms through subcontracting.

The strength of this producer market linkage is an important determinant of the size of the modern informal sector. It increases with growth and competitiveness of the formal sector, as higher cost-cutting pressure increases demand for informal intermediate goods. As long as the formal sector grows, and especially if it is competitive, the modern informal sector will grow as well. Its growth also depends on the resources available (mainly skills and capital), and government policies that affect the relative prices of modern informal and formal goods.

The purpose of this paper is to operationalize the division of the informal sector into a traditional and a modern subsector, in order to analyze the formal-informal relationship empirically for the case of India. House (1984) and Arimah (2001) both find that informal firms (in Kenya and Nigeria, respectively) with higher entrepreneurial income, more capital invested, and more educated workers, are more likely to have subcontracting or direct sales linkages with formal firms. Instead of identifying the relationship between informal firm attributes and informal-formal linkages, we use these attributes to group firms into a modern and traditional segment. In this manner, we investigate in a systematic way how formal sector growth affects both segments of the informal sector. In particular, we ask whether formal sector growth is positively related to informal sector growth through production linkages, and whether the distinction between traditional and modern informal activity matters for this relationship.

The empirical analysis is based on nationally representative surveys of formal and informal manufacturing firms in India. The distinction between the traditional and modern informal firms is made at the industry level, based on education of firm owners,

labor productivity, capital per worker, and product type. We analyze the formal-informal relationship at the state-industry level.

The results show that modern informal sector growth is positively related to ‘downstream’ formal sector growth and competitiveness. This indicates the existence of producer market linkages, whereby formal firms purchase intermediate products from or outsource activities to the informal sector. In line with our expectations, such a relationship is not found for the traditional informal sector. Our results thus support the notion that differentiation within the informal sector is important for the analysis of formal-informal linkages. And this, in turn, has implications for the design of appropriate policies.

## **2. Determinants of modern informal sector growth**

We start from the premise that both the formal and informal sector can be represented as a continuum of firms, but that we can identify two segments within each sector. The formal sector is divided in a large-scale sector and a Small and Medium Enterprises (SME) sector. The large-scale sector is composed of firms that are capital intensive, pay higher wages, use imported technology and intermediate goods, and possibly exploit scale economies. The SME sector is composed of smaller firms that make use of capital but are not necessarily capital intensive. Firms in the SME sector produce less sophisticated goods than the large-scale sector, possibly under constant returns to scale and perfect competition.

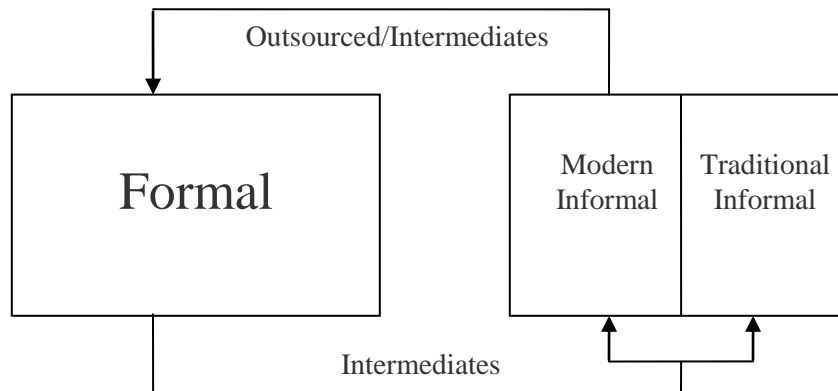
The informal sector consists of a traditional and a modern subsector. The traditional sector is composed of firms with very low or no capital use and few workers (mostly family members), that operate within the premises of a household or have no fixed location and that mostly undertake very low value-added activities such as small-scale retail sales, artisanal production or personal services. The modern sector is composed of firms that make use of some capital, have a fixed location (mostly outside the household) and produce standardized goods and services making use of low- and medium-skilled labor (with which they may engage in a contractual relationship).

Given this setting we turn to the analysis of the relationship between formal and informal firms in producer and consumer markets.

## 2.1 Producer market

Figure 1 illustrates the possible relations between formal and informal firms in the producer market. The formal sector is a client for informal firm's products through direct sales or outsourcing. While the demand for (intermediate) inputs is determined by the size and growth of formal firms, the demand generated through outsourcing depends on the reasons why formal firms outsource part of their production process. These can include labor cost saving efforts and greater flexibility in production capacity in the face of demand fluctuations (Holl, 2008).<sup>1</sup> One can expect that activities outsourced to the informal sector are the most labor-intensive (Hemmer and Mannel, 1989). This is where the relative cost advantages of the informal sector are, while the complexity of activities that can be carried out by informal firms is limited by their technology and capital use.<sup>2</sup>

Figure 1: Intermediate demand linkages



The 'outsourcing propensity' of formal firms therefore depends on the cost advantage of informal firms, which in turn depends on institutional aspects such as labor regulations and the legal minimum wage (WTO and ILO, 2009). In general, also, if competitive pressure leads formal firms to seek links with informal firms as a cost-cutting strategy,

<sup>1</sup> A third reason for subcontracting is the demand for specialized inputs for which the minimum scale of the firm is insufficient, such as financial and business services. We assume here that informal firms cannot produce specialized inputs given their scale and technological limitations.

<sup>2</sup> As noted by Weeks (1975), formal sector products that require sophisticated technology for quality reasons, provide little or no scope for subcontracting with the informal sector.

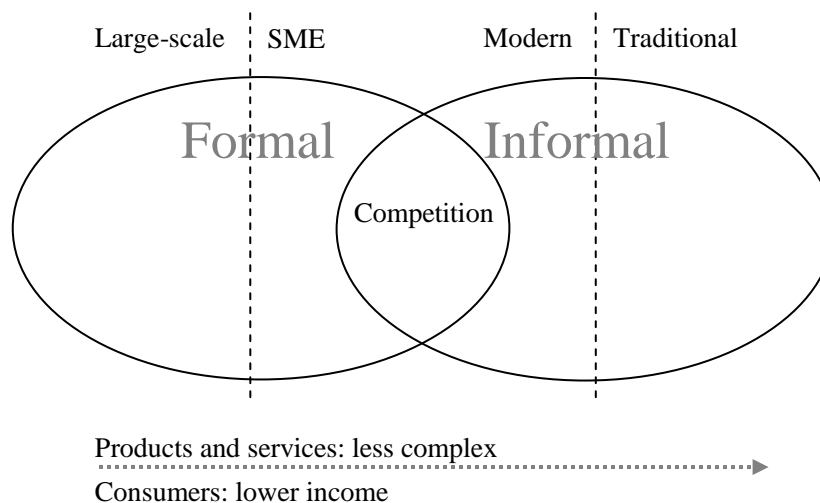
the informal sector would be favored by more competition within the formal sector (Ranis and Stewart, 1999).

Given that traditional informal firms do not have the capacity to respond to the quantity and quality requirements of the formal sector (Ranis and Stewart, 1999), we hypothesize that this *forward linkage* is present only for modern informal firms.<sup>3</sup>

## 2.2. Consumer market

In the consumer market, traditional informal firms survive because of the existence of segmented consumer markets: they fill market niches by selling low quality, cheap goods, by being proximate to consumers, by extending their opening times or by selling products in smaller quantities.<sup>4</sup> The market opportunities created in this way satisfy mostly low-income consumers. Given that traditional informal firms and formal firms operate in different segments of the market, the traditional informal sector does not pose a *direct* threat to the formal sector.

Figure 2: Competition on the consumer market



<sup>3</sup> There can also be a *backward linkage* if the formal sector is a supplier of inputs for informal firms. As explained by Tokman (1978) the strength of this backward linkage partly depends on the market structure of the industry where informal firms acquire their inputs. As this effect is difficult to measure in our data, we leave the inclusion of this linkage for future research.

<sup>4</sup> Other reasons for clients to prefer informal goods and services over formal ones include trust, cooperation and informal credit (Hart, 1973; Tokman, 1978).

On the contrary, modern informal firms can enter into direct competition with formal firms (Figure 2) if modern informal sector firms grow to the point where they resemble formal SMEs. In this respect, within every industry, the presence and growth of SMEs could directly affect the size and growth modern informal firms.

The advantage of informal firms over formal SMEs is that they have lower start-up and operational costs given that they evade taxes and regulations. Their disadvantage is that they cannot expand beyond certain size even if their profitability permits it, because they will become “visible” to the government. Thus, from the consumer market perspective, the size and growth of informal firms will also depend on the regulatory framework.

Lastly, the demand for products from the informal sector depends, among other things, on the level of per capita income and its distribution (Ranis and Stewart, 1999). If per capita income is low or income inequality is high, most of the demand will be concentrated in goods and services provided by traditional informal firms. Increases in income or improvements in income distribution could therefore change the pattern of demand away from goods and services produced by the traditional informal sector, towards the modern informal sector and the formal sector.

### **3. Data and measurement**

Our empirical analysis is focused on the formal-informal producer market relationship. We analyze this relationship using data on Indian manufacturing firms. Manufacturing accounted for about 15 per cent of GDP and 25 per cent of urban employment in 2004-05, shares that have been more or less stagnant over the past decades. Within manufacturing, the informal sector accounted for about 80 per cent of employment and 20 per cent of value added in 2005-06. One of the main differences between formal and informal firms in India is that the former are subject to labor regulation. Employment protection increases the cost of labor and has been associated with lower employment in formal manufacturing by Besley and Burgess (2004) and Dougherty (2008). India thus provides an interesting case to analyze the presence and effect of formal-informal linkages, as informal firms are likely to have a significant labor cost advantage.

In India, where the term ‘informal’ is not used officially, the most common distinction is that between organized (registered) and unorganized (unregistered) firms. Registered manufacturing firms are those employing 10 or more workers using power, and those employing 20 or more workers without using power. Smaller manufacturing firms are unregistered.

Data on the formal sector are obtained from the Annual Survey of Industries (ASI) for the years 2000-01 and 2005-06, which cover all registered factories. Data on the informal sector are obtained from the National Sample Survey (NSS) unorganized manufacturing survey for 2000-01 and 2005-06. This survey covers all private manufacturing enterprises that are not covered by the ASI. The unit level data are aggregated to state-industry level, and we limit our analysis to the urban economy. Industries are defined at the 2-digit level, as listed in Appendix table A.1.<sup>5</sup>

A key element of our analysis is the distinction between traditional and modern informal manufacturing. Ranis and Stewart (1999) suggest some criteria to identify the modern informal sector, including the production of intermediate goods, significant capital per worker, use of skills, and use of hired labor. They describe certain industries as typically modern, and others as traditional. An alternative would be to classify a single firm as either modern or traditional, such that every industry has a modern and a traditional informal segment. One drawback of this alternative is that the classification of a firm is less stable over time than that of an industry. Another drawback is that the number of observations in each state-industry-subsector cell is reduced, which increases measurement error. We therefore follow the approach of Ranis and Stewart, and use an industry-level classification. According to our classification, then, in a modern informal industry the majority of firms belong to the modern subsector.<sup>6</sup>

For our classification we use four industry characteristics: average capital per worker, average labor productivity, median education level of firm owners, and product type. At the two-digit industry-level, capital per worker is highly correlated with output per

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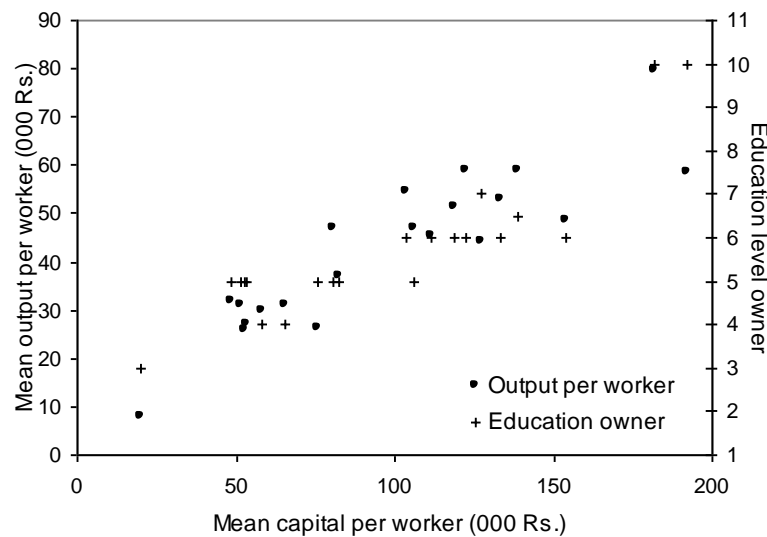
<sup>5</sup> To assess the reliability of the survey data we compare our estimates of states’ total formal (registered) and informal (unregistered) manufacturing value added to state net domestic product in registered and unregistered manufacturing from the National Accounts. These total are highly correlated, providing credence to the use of data from these two surveys.

<sup>6</sup> However, the reader should keep in mind that in reality, each industry could include a continuum of firms both traditional and modern informal firms (see Figure 2 above).



worker and median education level of the owner (Figure 3). These three criteria generate similar rankings of industries in terms of their ‘modernity’. We choose to draw the line at a capital per worker level of 100,000 Rs. Within this range, almost all firms in less capital-intensive industries produce simple consumer goods, whereas most firms in more capital-intensive industries produce producer goods. The final classification is included in Appendix table A.1.

*Figure 3: Industry average capital per worker, productivity, and education*



*Source:* NSS unorganized manufacturing survey, 2005-06

The main difference between modern and traditional firms as we classify them is thus output per worker, capital per worker, education of the owner, and product type. Other characteristics for which we have data are the number of (hired) workers, the location of the enterprise, destination agency of sales, and the nature of problems faced.

The number of hired workers per firm is significantly higher in the modern informal sector, though both subsectors include firms with and without hired workers. In both years, about 60 per cent of the firms in the traditional informal sector are located within household premises, as opposed to only 25 per cent of modern informal sector firms. Firms in the modern informal sector are much more likely to sell their final output to private enterprises, although we do not know whether the destination firm is formal or informal. In 2000-01 about 16 of traditional and 18 per cent of modern informal firms

reported that competition from larger units was a problem. In 2005-06 this share increased to almost 25 per cent for modern informal firms. Again, it is unclear whether these larger units are formal or informal firms, but we see that in both subsectors competition plays a role. Regarding capital shortage, this is a problem more often for firms in the modern informal sector, which is in line with higher capital requirements in this subsector. Still, a substantial share of firms in the traditional informal sector also reports capital shortage as a problem.

*Table 1: Characteristics of firms in the traditional and modern informal sector*

	2000-01		2005-06	
	traditional	modern	traditional	modern
% firms without any hired workers	75.5	37.7	75.5	36.7
Average number of hired workers	1.2	2.3	1.3	2.8
% firms located within household premises	59.5	26.8	62.7	24.4
% firms selling to private enterprises	31.2	52.1	32.2	54.5
% firms facing competition from larger units	15.7	18.3	18.9	24.8
% firms facing shortage of capital	46.4	58.6	40.2	49.1
Number of firms in sample	72,929	14,248	31,565	7,241

*Source:* NSS Unorganized Manufacturing Survey. Note: The sample size in 2005-06 is much lower than in 2000-01. According to the NSSO, however, there are only minor differences in coverage

As regards the formal sector, Ramaswamy (1999) shows that in 1994 the subcontracting intensity in formal manufacturing was more than 25 per cent. Measured as the ratio of the value of goods sold in the same condition as purchased to value added, this share excludes other forms of subcontracting such as contract work performed on materials supplied. Though not all of this subcontracting will be directed to the informal sector, it is clear that subcontracting is important in Indian manufacturing. That means there is scope for a forward production link between informal and formal manufacturing.

#### **4. Empirical model**

Since we have no reliable measure of formal firms' outsourcing or input purchases from the informal sector, the importance of this link cannot be estimated directly.<sup>7</sup> Rather, we use growth and competitiveness of the formal sector, in line with the

<sup>7</sup> The NSS unorganized manufacturing survey does give information about whether a firm undertook any contract work during the reference year. However, we feel this definition is too loose to use. Furthermore, subcontracting is only part of the forward linkage we are interested in.

framework of Ranis and Stewart (1999). The main hypothesis is that a faster growing and more competitive formal sector enhances modern informal sector growth through production linkages.

Since production linkages can exist within and between industries, we model a relationship between the informal sector of industry  $i$  and all “downstream” formal sector growth and competitiveness: a downstream industry is one that buys intermediate products from industry  $i$ . Downstream industries are identified using the 2003-04 Input-Output table, aggregated to correspond to the 2-digit NIC classification.<sup>8</sup>

Equation (1) is estimated for the entire informal sector, and for modern informal and traditional informal industries separately.

$$\Delta \ln(E)_{is} = \beta_0 + \beta_1 \Delta \ln(Y\_downstream)_{is} + \beta_2 HI\_downstream_{is} + \gamma Z_{is} + \mu_i + \eta_s + \varepsilon_{is} \quad (1)$$

The dependent variable is the log change of informal employment in a given industry  $i$  and state  $s$ , between 2000-01 and 2004-05.

Formal sector growth is measured as a weighted sum of downstream formal output growth:  $\Delta \ln(Y\_downstream)_{is} = \Delta \ln \sum_j \{Y_{js} output_{ij}\}$ , where  $Y_{js}$  is formal sector output in industry  $j$  in state  $s$  and  $output_{ij}$  is the share of industry  $i$ 's output sold to industry  $j$  according to the 2003-04 Input-Output table. The Input-Output table does not distinguish formal and informal manufacturing, so the production links between two industries do not necessarily include informal firms. However, we hypothesize that modern informal firms do play a role in these linkages, whereas traditional informal firms do not. Thus, our expectation is that downstream formal growth is positively related to growth only in the modern informal sector, while it is unrelated to growth in the traditional informal sector.<sup>9</sup>

Downstream formal sector competitiveness is measured as a weighted average of the formal sector Herfindahl Index:  $HI\_downstream_{is} = \sum_j \{HI_{js} (output_{ij} / \sum_j output_{ij})\}$ . The Herfindahl Index is a measure of concentration, so higher values are associated with less

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<sup>8</sup> Two industries have been merged to correspond to the Input-Output classification. These are “Manufacture of office, accounting and computing machinery” and “Manufacture of radio, television and communication equipment and apparatus”.

<sup>9</sup> We assume informal firms operate predominantly on the local market, so downstream formal sector growth includes only growth in the own state.

competition. Based on Ranis and Stewart (1999) we hypothesize that competition in the formal sector is beneficial for the modern informal sector, so  $\beta_2$  is expected to be negative.

$Z$  is a vector of control variables, including the capital-labor ratio in the informal sector, the share of informal firms that report facing competition from larger units, the share that reports facing capital shortage, and the initial level of employment.

A positive coefficient for the capital-labor ratio could indicate that more capital-intensive informal industries are better capable of meeting formal sector demands, or simply have more capacity to expand. On the other hand, if the nature of the activity is more capital-intensive, it may be harder to expand given limited access to capital. With about half of modern informal firms reporting that capital shortage is a problem, this is not unlikely.

We expect a negative relation between employment growth and the initial share of firms reporting that competition from larger units is a problem. Since larger units could be formal or informal, the effect could appear in both the modern and the traditional informal sector. The effect of capital shortage is also expected to be negative, but only in the modern informal sector.

The initial level of employment in the state-industry is a standard control variable, which is expected to have a negative coefficient reflecting measurement error or real mean reversion (see Glaeser *et al.*, 1992), though the latter interpretation would not apply to the traditional informal sector.

Fixed effects for industry and state are included. The state fixed effects rule out the use of other state-level variables, so we cannot control separately for states' per capita income, income distribution, labor regulation or other factors that have been related to formal and informal sector dynamics.<sup>10</sup> We consider, however, that including fixed effects is a better way to control for observed and unobserved state characteristics.

Before turning to the results, Table 2 below shows the mean values of all variables and the difference between the modern and traditional informal sector.

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<sup>10</sup> Maiti and Marjit (2009) show that the informal share of gross value added in a given state and industry is positively related to pro-worker labor regulation, state's development expenditure, and contract labor laws enforcement. Jonasson (2009) show that in Brazil informality is higher in regions with lower education, less effective government, and weaker social norms.

Table 2: Descriptive statistics dependent and independent variables

Variable	All informal		Modern informal		Traditional informal		Modern-Traditional Difference
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Diff.
$\Delta \ln(E)$	-0.05	1.12	0.04	1.21	-0.14	1.03	0.18 *
$\Delta \ln(Y_{downstream})$	0.47	0.42	0.44	0.40	0.49	0.43	-0.05
$HI_{downstream}$	0.09	0.07	0.09	0.07	0.09	0.08	0.01
$\ln(K/L)$	10.73	0.77	11.10	0.59	10.42	0.77	0.68 ***
$Problem_{comp}$	0.16	0.16	0.16	0.17	0.15	0.15	0.02
$Problem_{capital}$	0.52	0.26	0.54	0.27	0.49	0.24	0.05 **
$\ln(E_{00})$	8.65	2.20	7.90	2.08	9.31	2.09	-1.41 ***
N	410		190		220		

Note: \* significant at the .10 level; \*\* significant at the .05 level; \*\*\* significant at the .01 level.

Employment growth was negative in the informal sector, driven by the traditional informal subsector. The large standard deviation indicates substantial dispersion of growth. Downstream formal sector output growth is quite high for both subsectors, so if formal-informal production linkages are unrelated to informal sector characteristics, the modern and traditional informal subsector could benefit equally from formal sector growth.

The downstream formal sector Herfindahl Index is slightly higher for the modern informal sector. Unsurprisingly, given our definition of modern and traditional, capital per worker is higher in the modern informal sector. In both sectors, about 16 per cent of firms faced competition from larger units in 2000-01, and about half of the firms faced capital shortage problems, as discussed above. Capital shortage was a problem more often reported by modern informal firms. Finally, initial employment was significantly higher in the traditional informal sector than in the modern informal sector.

## 5. Results

Table 3 contains the results of the OLS regression specified above, except that the capital shortage variable is excluded as it was insignificant in all cases (this does not affect the other results). The first column shows results for the entire informal sector. The sample is split into modern and traditional subsector in columns two and three, resp. The dependent variable in all regressions is the log change in state-industry employment

between 2000-01 and 2005-06. We also ran the regressions with gross value added growth as dependent variable. The results are not reported here as they are qualitatively the same.

Table 3: Informal sector employment growth 2000-05

Dependent variable: $\Delta \ln(E)$	All informal	Modern informal	Traditional informal
$\Delta \ln(Y_{downstream})$	0.184 (0.243)	0.835** (0.381)	0.107 (0.250)
$HI_{downstream}$	-1.836 (1.160)	-3.254* (1.801)	-1.340 (1.281)
$\ln(K/L)$	-0.105 (0.113)	-0.317* (0.167)	0.044 (0.164)
$Problem_{comp}$	-0.515 (0.482)	0.490 (0.398)	-1.936*** (0.532)
$\ln(E '00)$	-0.403*** (0.102)	-0.663*** (0.089)	-0.193 (0.176)
<i>Constant</i>	5.393*** (1.752)	9.872*** (1.945)	1.299 (3.131)
N	410	190	220
R <sup>2</sup>	0.15	0.25	0.11

Note: OLS estimation with state and industry fixed effects. State-clustered standard errors are in parentheses; \* significant at the .10 level; \*\* significant at the .05 level; \*\*\* significant at the .01 level.

First, in line with our hypothesis, output growth in downstream formal manufacturing is positively related to growth in the *modern* informal sector. The effect is insignificant in the traditional informal sector, and in the informal sector as a whole. We regard this as evidence in favor of the existence of a production link between modern informal and formal manufacturing. Through this link, formal sector output growth enhances employment and value added in the modern informal sector.

Second, the coefficient for the downstream formal sector Herfindahl Index is negative for the modern informal sector, as expected. More competition among formal firms in downstream industries (a lower Herfindahl Index) is associated with higher employment growth in modern informal manufacturing. Again, there is no significant effect in the traditional informal sector or in the informal sector as a whole. For a given rate of growth in downstream formal manufacturing, modern informal employment grows faster if downstream formal firms have less market power. This is in line with competitive

pressure inducing formal firms to seek production links with modern informal firms (Ranis and Stewart, 1999).

The coefficient for the log capital-labor ratio is significantly negative only in the modern informal sector, indicating that growth was higher in more labor-intensive modern informal activities. This could reflect that capital-intensive firms find it harder to expand due to limited access to capital, although we found no effect of actual capital shortage problems on growth.

Facing competition from larger units does not appear to be related to modern informal sector growth. Interestingly, though, it is negatively related to growth in the traditional informal sector. Since the traditional informal sector mainly produces simple consumer goods, this negative relation could indicate that larger informal firms out-compete the smaller ones, as it is unlikely that they compete directly with formal firms.

Finally, the initial level of employment is negatively related to employment growth for the informal sector as a whole and for the modern informal sector.

The effect of downstream formal sector growth is robust to dropping state-industries with fewer than five informal firms surveyed or dropping any one state from the sample. We also ran the regression with state level variables (population growth, initial inequality, and per capita state domestic product growth) instead of state fixed effects. This does not affect the result for downstream demand growth either. It is difficult, however, to interpret the coefficients of these state level variables, because they are likely to be correlated with other (unobservable) state characteristics. The effect of downstream competition is less robust, as the significance level rises above ten per cent in some cases.

## **6. Discussion and conclusions**

A number of conclusions can be drawn from our empirical analysis. First of all, growth in the modern informal manufacturing sector is positively related to output growth in downstream formal manufacturing. This is in line with the view that the formal and modern informal sectors are complementary.

Second, there is no evidence of a formal-informal production link for the traditional informal sector. This confirms the importance of informal sector characteristics for the formal-informal relationship: the production linkage does not exist when informal firms

have low capital per worker, low labor productivity, low education of firm owners, and produce simple consumer goods.

Third, we find that competitiveness in the formal sector is positively related to modern informal sector growth, though this result is not very robust. As Ranis and Stewart (1999) argue, competition among formal firms increases the pressure to cut costs. Purchasing inputs from or outsourcing activities to the informal sector can be seen as cost-cutting strategies. This effect of competition is not found for the traditional informal sector.

All in all, accounting for informal sector heterogeneity is important when analyzing formal-informal linkages. Our results also imply that informal sector heterogeneity must be taken into account for the design of appropriate policies. Policy prescriptions according to Tokman (1978) include improving technology within the informal sector and strengthening the formal-informal link. According to our results, such policies should be directed to the modern informal sector.

The conclusions we can draw are limited, however, as the empirical analysis focuses almost exclusively on the forward production link. We would need additional years of data to properly investigate consumer market linkages, as these are related to state level variables like income per capita and its distribution. Furthermore, it must be noted that the linkages in the services sector may differ from those in manufacturing. It remains a question whether the traditional-modern distinction bears empirical relevance for informal services.

Finally, an important question for future research is how the modern informal sector contributes to productivity and growth in the formal sector. Based on our results, we may expect that the contribution of modern informal firms is positive as they allow formal firms to be more flexible and competitive, at least in manufacturing. La Porta and Shleifer (2008) argue that informal firms are extremely unproductive and that growth is generated only by formal firms, so we should hope the informal sector disappears over time. Before drawing such a conclusion, we believe it is worthwhile to investigate the contribution of the modern informal sector more closely at the country and industry level.



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## Appendix

Table A.1: Manufacturing industries 2-digit codes National Industrial Classification 1998

15	Manufacture of food products and beverages	Traditional
16	Manufacture of tobacco products	Traditional
17	Manufacture of textiles	Traditional
18	Manufacture of wearing apparel; dressing and dyeing of fur	Traditional
19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	Traditional
20	Manufacture of wood and products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	Traditional
21	Manufacture of paper and paper products	Traditional
22	Publishing, printing and reproduction of recorded media	Modern
23	Manufacture of coke, refined petroleum products and nuclear fuel	-
24	Manufacture of chemicals and chemical products	Traditional
25	Manufacture of rubber and plastics products	Modern
26	Manufacture of other non-metallic mineral products	Traditional
27	Manufacture of basic metals	Modern
28	Manufacture of fabricated metal products, except machinery and equipment	Modern
29	Manufacture of machinery and equipment, n.e.c.	Modern
30	Manufacture of office, accounting and computing machinery	Modern
31	Manufacture of electrical machinery and apparatus n.e.c.	Modern
32	Manufacture of radio, television and communication equipment and apparatus	Modern
33	Manufacture of medical, precision and optical instruments, watches and clocks	Modern
34	Manufacture of motor vehicles, trailers and semi-trailers	Modern
35	Manufacture of other transport equipment	Modern
36	Manufacture of furniture; manufacturing n.e.c.	Traditional
37	Recycling	-