

Linkages between Sectoral Output Growth and Financial Development in Nepal

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Abstract

A feature of the recent period of output growth in Nepal is that growth has been uneven across sectors. While the services sector has been expanding, the agricultural and manufacturing sectors have growing much more slowly. In this paper we attempt to explain this fact by investigating the linkages between financial development and sectoral output growth in a vector-autoregression (VAR) analysis. We find that the services sector reacts strongly to increases in domestic credit, while agriculture and manufacturing are largely unaffected. We interpret this finding in the context of a two sector-growth model, by Schneider and Tornell (2004), where credit constraints and the access to international capital markets play a central role. We also discuss the importance of our findings for the goal of poverty alleviation.

Key words: Financial development, growth, agriculture, poverty

JEL Classification: O11, O16, O53, F41

1. INTRODUCTION

The recent period of output growth in Nepal, has been quite uneven across sectors.¹ While the services sector was able to expand, the manufacturing and agricultural sectors were growing more slowly in the 2000s. At the same time, the financial system has been gradually deregulated and domestic credit has been expanding. In this paper we analyse the empirical link between domestic credit growth and output growth at a sectoral level and discuss the implications of our finding in the context of a two-sector growth model and of the debate on poverty alleviation.

In terms of services and manufacturing, the findings for Nepal, are quite reminiscent of other countries, as well as theoretical predictions on the sectoral output response. A two sector-growth model, originally developed by Schneider and Tornell (2004), where credit constraints and the real exchange rate play a role helps to interpret the results of the

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¹ A pattern that is also common for other countries in South Asia (see Eichengreen and Gupta (2009)).

empirical analysis.² In this model, the tradable goods producing sectors finance themselves mainly in international capital markets and are independent of domestic credit conditions. The non-tradable goods producing sectors however, often including services, obtain finance from the domestic banking system and are more closely linked to domestic credit changes. Tornell and Westermann (2002) document that this pattern exists in a wide cross section of developing economies.

The pattern in the agricultural sector, on the other hand, is quite uncommon, when compared to other developing economies, and in particular when compared to Europe in the process of industrialization, more than a hundred years ago. Diekmann and Westermann (2011) have shown that the agricultural sector, has reacted most strongly to domestic credit, among all sectors, in 19th century Germany. In fact, the banking system took its origins in small credit co-operatives, which financed the “agricultural revolution”, than preceded the rapid process or industrialization during the second half of the 19th century. A comparable sequential process is not observable in Nepal’s economy today.

The pattern of development in the agricultural sector is clearly a reason for concern in the development of Nepal’s economy. The agricultural sector is not only the largest sector in the economy, but also a sector with below average wages. Data from the national labour force statistics illustrate that more than 70% of the population and up to 80% in rural areas are employed in the agricultural sector. At the same time, the data on income by occupation reveals that market agriculture, and particularly subsistence agriculture, are characterized by below average wage.

The remainder of the paper is organized as follows. Section 2 discusses the methodology used in the empirical part of the paper. Section 3 contains a graphical analysis of the data and reports the standard descriptive statistics. It also contains the preliminary analysis, testing for stationarity and cointegration. Section 4 reports the main findings of the impulse-response analysis. Section 5 discusses the findings in the context of the debate on poverty alleviation and section 6 concludes.

2. METHODOLOGY

In our study, we use a long sample of annual sectoral output growth rates, starting in 1973, leading up to 2010, as well as several shorter samples. We investigate the empirical link between credit and output at the sectoral level. We start with implementing standard unit root tests (Augmented Dickey-Fuller tests) in order to assess the stationarity properties of the data. Secondly we investigate long run co-movements by implementing the Johansen Cointegration test. As both tests will indicate, that variable are (i) non-stationary in level, (ii) stationary in first differences and (iii) not cointegrated, we implanted the main part of the exercise by estimating an unrestricted Vector-autoregression (VAR) in first differences.

From the estimated coefficients of the VAR, we compute the impulse response functions displayed in figure 5 of section 4. A key issue – like in other VAR studies – is the

² See also Tornell, Westermann and Martinez (2003) for a simpler representation.

identification of shocks, as there might be some contemporaneous correlation among the variables that is not explicitly modeled in our time-series setup. In order to address this issue, we use generalized impulse response functions in order to trace the impact of an unexpected shock in domestic credit on output at the sectoral level.

The use of generalized impulse response functions, help mitigate the endogeneity problem associated with the contemporaneous correlation between credit and output. It is independent of the ordering of variables in the VAR, unlike for instance in the Choleski decomposition. The shock we trace, is a system shock that include the contemporaneous reaction of other variables.

All VAR estimated are bi-variate pairs of sectoral output and lending. The lag-length was determined by the SIC criterion. As common in annual data, most VARs are either AR(1) or AR(2) processes. We have experimented with different lag length, for instance chosen by the AIC criterion. We did not find, however that this variation had substantial impact on our findings. We chose the more parsimonious specification of the SIC, because looking at the residuals of the regressions, we did not find a remaining autocorrelation that was not controlled for by the explanatory variables in the model.

3. DATA AND PRELIMINARY ANALYSIS

In this section, we start the analysis with a graphical representation as well as descriptive statistics of the time series under investigation. First, we consider a sectoral breakdown of aggregate lending. Figure 1 decomposes the total stock of domestic credit into various sectors, including the main sub-sectors, agriculture, manufacturing and services that will be included in the empirical analysis in the following sections (we show a more disaggregated breakdown here that is feasible in a cross section. In the later part of the analysis, we will focus in broader aggregates of sectors, for which we have time series data both, in nominal and in real terms).

Figure 1 show that the largest share of domestic credit is provided to firms in the services sectors. In sum, the sectors transport, communication and public services, wholesale and retail trade, financial sector and other services, account for 37% of total domestic lending (10% if this figure is accounted for by the financial sector itself). The second largest sector is the manufacturing industry, with a share of 22%, followed by the construction sector with a share of 11%. Other sectors have much smaller shares. The agricultural sector, the second largest sectors in the economy with respect to output, and the largest with respect to employment, holds only 3% of total domestic credit.³

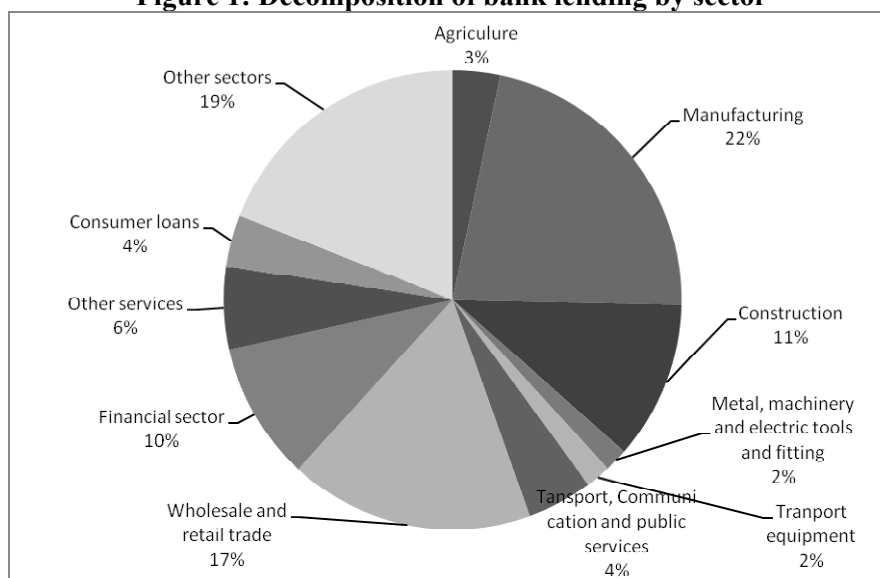
Interesting is also the share of consumer loans in total loan, which is only 4%. In the literature on financial development⁴ and growth, this is an indicator of particular

³ An econometric analysis of the determinants of lending to various types of households and regions is given in Adhikari (2009). The role of institutions for providing micro-finance and analyzed in Shrestha (2009).

⁴ By financial development we refer to domestic lending relative to GDP.

importance. If the share of consumer loans in total loans is high, the hypothesis that domestic credit is followed by real output growth is often challenged. However when the largest part of the lending is given to firm, who invest, this investment expands production possibilities and ultimately leads to long run growth. With a share of consumer loan of only about 4%, it seems that the preconditions that financial development can have a positive impact on growth are met.

Figure 1: Decomposition of bank lending by sector



Source: Nepal Rastra Bank, Economic Report 2008/9, Table 7.5

Figure 2a and 2b show the development of long run growth in the main sectors of the economy. The values are expressed in constant prices. Unless indicated otherwise, all data are drawn from the World Bank Developing Indicators (WDI) of the World Bank. Figure 2a shows the levels of output, while figure 2b shows the share of each the three main sectors in total output in the economy. We see that in the beginning of the sample period, the agricultural sector was clearly the most important sector, with a share of more than 50% of total value added in the economy. Although it has grown steadily over the past 38 years, its long run real rate of growth of 2.65%, as reported in Table 1, is clearly below that of the other two sectors. The manufacturing sector has a larger growth rate, with 5.3% of real growth on average; however, its share in total output is rather small, increasing to about 7% of GDP towards the end of the sample. The services sector, on the other hand is both, large in term of share in GDP, and in terms of annual real growth rates. Over the past 38 years, the service sector has grown 4.63% on average and has become the largest sector in total GDP since the early 1990ies. In 2010, it accounted for 43% of total output in the economy.

Figure 2a: Sectoral output – levels in constant prices

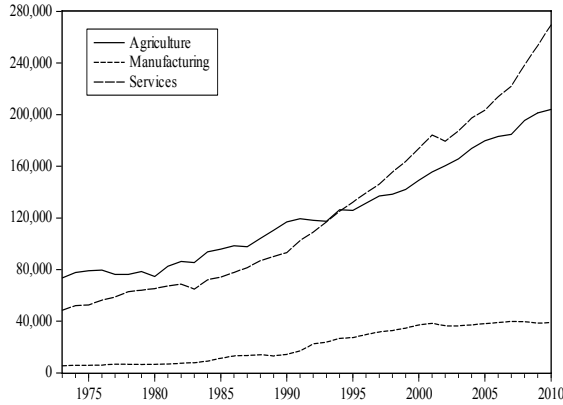
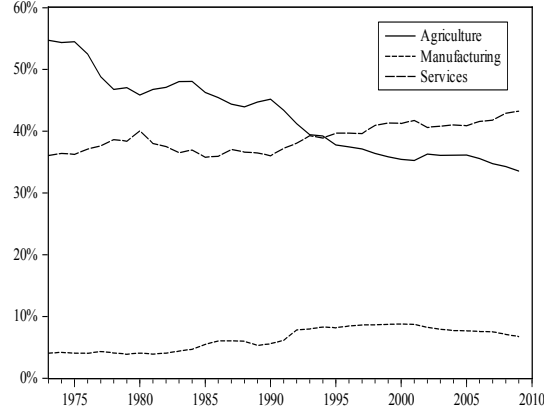


Figure 2b: Share in value added

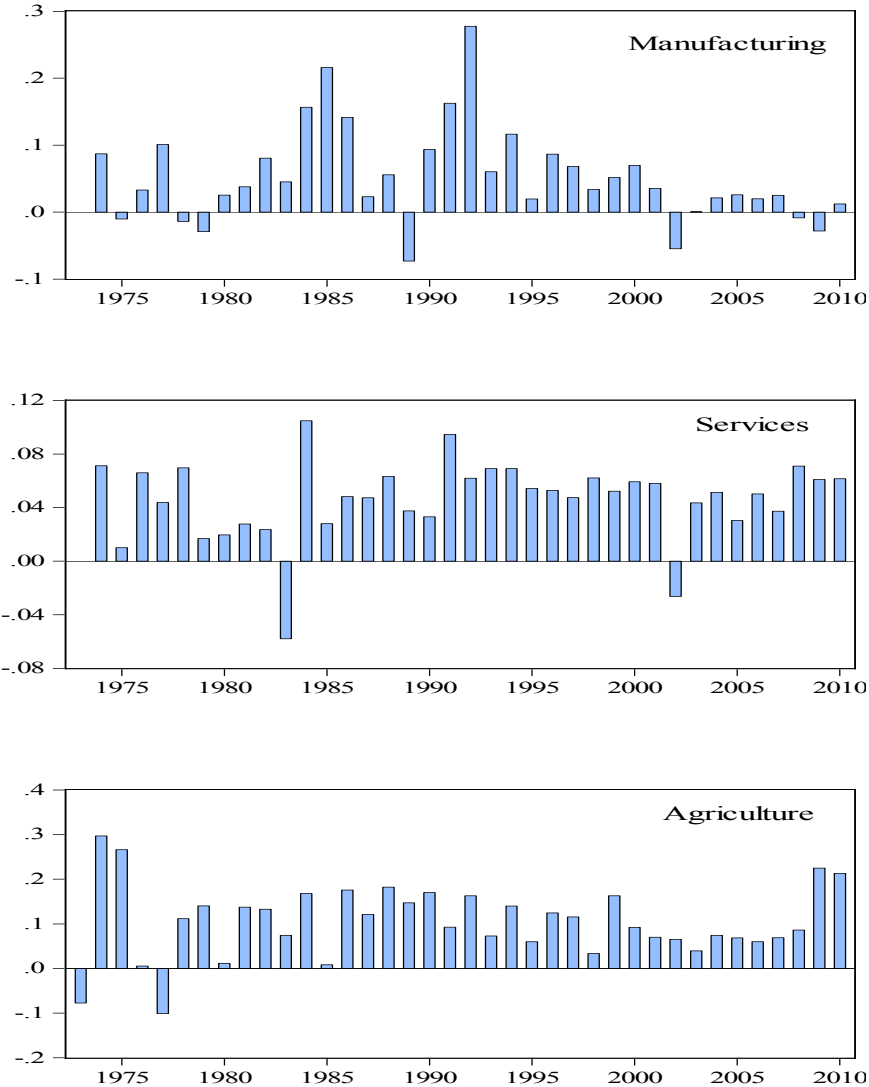


Source: World Development Indicators (WDI)

Figure 3 displays the annual percentage growth rates that enter the subsequent empirical analysis in the vector-autoregressions (VARs). The figure shows that on top of the differences in long run average growth rates, the growth rates also differ with respect to the variance and the occurrence of occasional outliers. While the agricultural sector and services sector have relatively stable growth rates since 1980s, with a standard deviation of 2.9% and 3.2%, respectively, the manufacturing sector is considerably more volatile. In particular during the mid-80ies and early 1990s, there were rapid expansions in manufacturing. In the later 70s and earlier 2000s, there were multiple-year recessions. The occasional downturn as well as the boom-periods was also larger in absolute terms, as shown in Table 1 below.

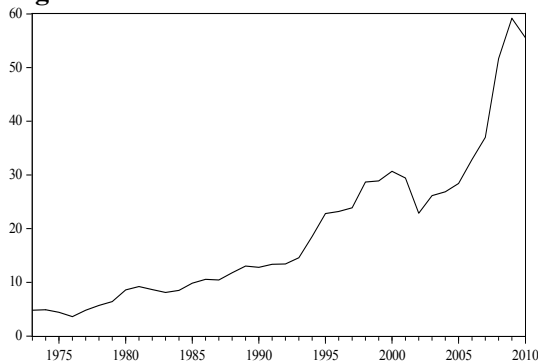
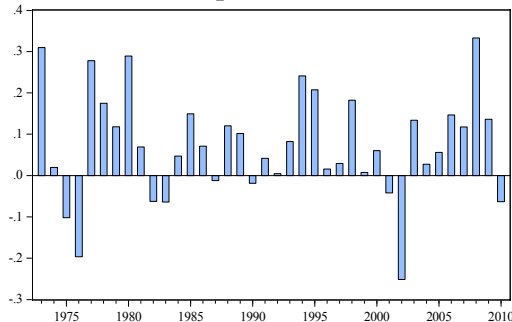
Table 1: Descriptive statistics

	Agriculture	Services	Manufacturing	Domestic credit
Mean	0.0265	0.0463	0.0530	0.0726
Maximum	0.0997	0.1048	0.2776	0.3331
Minimum	-0.0490	-0.0578	-0.0732	-0.2517
Std. Dev.	0.0323	0.0295	0.0715	0.1296

Figure 3: Growth rates of value added in manufacturing, services and agriculture

Source: World Development Indicators (WDI)

The last time series in our subsequent analysis is the domestic credit to the private sector, provided by the banking system. This series is plotted in Figures 4a and 4b, as a ratio of gross domestic product, as well as in logged first differences. From Figure 4a, it is clear that Nepal experiences a substantial increase of financial development over the time period under investigation. Until the early 1990s, there was a smooth and steady increase. During the 1990s the credit-to-GDP increased substantially, doubling in magnitude, from 15% in 1993 to 30% in the year 2000. After a short decline in the early 2000s, another rapid expansion occurred in the second half of the first decade of the 2000s. In 2009 the credit-to-GDP ratio reached a peak value of 59%.

Figure 4a: ratio of domestic credit to GDP**Figure 4b: Growth rates of real credit to the private sector**

Source: World Development Indicators (WDI)

Although the nearly 60% credit-to-GDP ratio is nearly 10 times its value of the beginning of the sample, this number is not unusually high when compared to other countries experiences after financial liberalization. In particular the increase in domestic credit-to-GDP that occurred after the liberalization in the early 1990s – documented by Shrestha and Chowdhury (2007) – is quite reminiscent to the increase documented in a broad cross section of developing economies in Tornell and Westermann (2005).⁵

When looking at the growth rates of real credit growth (deflated by the consumer price index), we see that domestic credit is quite volatile throughout the sample period. Major contractions occurred in 1975/6 and 2002. Measurable downturns were also experienced in the early 1980ies, 1990 and, more recently, in 2010. Overall, the standard deviation of almost 13% is substantially higher than the fluctuation in real output in any of the main sectors. Also the absolute value of the negative growth rates is much larger, with negative values of up to 25%. The process of financial development in Nepal, although quite large when compared to the beginning of the sample, has been a risky one, with repeated severe setbacks. In this sense, again, the experience in Nepal is reminiscent of many developing economies, in which the process of financial liberalization is associated both, with an increase in the average GDP growth rate, but also an increase in the incidence of financial crisis (see Tornell and Westermann (2008))

As a preliminary analysis of the data, we conduct test for stationarity and cointegration. Table 2 reports the results of the augmented Dickey-Fuller test. In all regressions the lag length was chosen by the AIC criterion. We find that in all sectoral time series as well as the domestic credit series, we cannot reject the null hypothesis of a unit root in the logged levels, while we can reject it at the 1% level in all logged first differences that approximately correspond to the percentage growth rates. In the following analysis, we therefore treat the data as stationary in 1st differences.

⁵ As shown in figure A4 of the appendix, the agricultural sector also had a below average share in the latest credit expansion that started in 2007. In fact it is the only sector that fell in levels, in nominal terms.

Table 2: Unit root tests

	Agriculture		Manufacturing		Services		Domestic credit	
	ADF test-statistic	P-value	ADF test-statistic	P-value	ADF test-statistic	P-value	ADF test-statistic	P-value
Levels	0.672	0.990	-1.319	0.611	0.652	0.989	-0.604	0.858
1st differences	-7.004	0.000	-3.773	0.007	-6.779	0.000	-5.564	0.000

Note: Lag length was chosen by the AIC criterion. MacKinnon-critical values are applied.

In a second step, we also test for the cointegration properties of the data. Table 3 reports the results of the Johansen Cointegration test. It shows that all variables in the analysis following individual stochastic trends: we cannot reject the null hypothesis of no cointegration. This result is strengthened, when applying the stricter finite sample critical values that were reported by Cheung and Lai (1995).

Table 3: Test for Cointegration

Number of Cointegration Vectors	Eigenvalue	Trace statistic	5% Critical value	Maximum eigenvalue statistic	5% Critical value
None	0.421533	41.48248	47.85613	19.70544	27.58434
At most 1	0.335006	21.77704	29.79707	14.68719	21.13162
At most 2	0.176654	7.089847	15.49471	6.997633	14.2646
At most 3	0.002558	0.092214	3.841466	0.092214	3.841466

Note: Lag length was chosen by the AIC criterion.

4. EMPIRICAL ANALYSIS: THE SECTORAL RESPONSE TO AN UNEXPECTED SHOCK IN CREDIT

In this section, we investigate the responses of growth rates in agriculture, services and manufacturing to an unexpected change in domestic credit. As the above unit root tests revealed a unit root in the levels of the sectoral output and credit series, we start by estimating the vector-autoregression (VAR) in first differences. From the VAR coefficients, we compute the generalized impulse response functions that are reported in figure 5 below.

We estimate bi-variate VAR's and compute the corresponding impulse response functions for the three sectors under consideration. Figure 5 shows the reaction of output growth in agriculture, manufacturing and services to an unexpected shock in the growth rates of domestic credit. We start by analyzing the full sample from 1973 to 2010. We find, overall, that the responses are only weakly significant, at the 10% level, or statistically insignificant. In the agricultural sector there is an initial negative reaction, followed by equal sized positive reaction in the second year. Thereafter, as well as in the aggregate, the reaction is insignificant. In the manufacturing, the reaction is highly insignificant throughout the 10 year time-window under investigation. The only sector that displays a positive reaction in the services sector. Here the reaction is positive for the

first two years and (weakly) significant at the 10% level in the 1st year after the shock in domestic credit⁶.

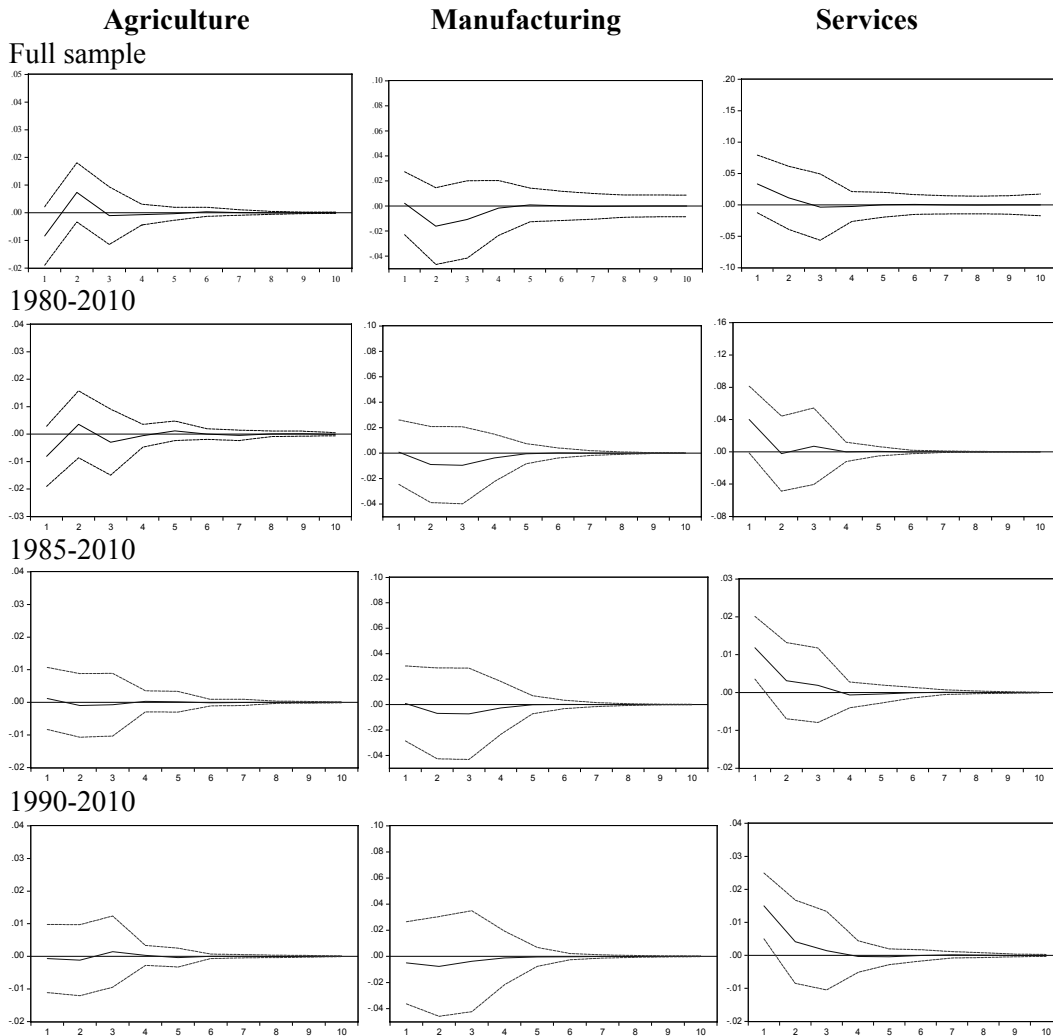
As the sample period includes years before the liberalization and deregulation of Nepal's financial system, we next shorten the time interval in several steps. This, by itself, would have the statistical effect that standard errors would widen, as the sample becomes shorter. However, as relatively more years are part of the period with more open and developed capital markets, the findings could also become sharper. In the sample period from 1980-2010, we see that the initial positive reaction of the services sector becomes statistically significant at the 5% level, while the other two sectors remain nearly unchanged. When shortening the sample even further, the agricultural sector turns insignificant over the entire 10-year response-window, while the services sector becomes even more clearly significant. This pattern remains also for the window from 1990-2010.⁷

While the insignificance of the agricultural sector in the later periods is an inconclusive finding, due to the reduced power of the test in smaller samples, it can be argued that the positive reaction of services to domestic credit growth is a rather recent phenomenon in the Nepalese economy.

⁶ This result is consistent with earlier finding by Gautam (2008), that analyses the impact of the tourism industry on GDP and the role of tourism financing.

⁷ The process of Nepal's financial sector reforms roughly corresponds to these time windows. Shrestha (2004) documents the various steps of financial sectors development in Nepal. In his analysis, the first period of financial sector reform started in 1984 and the second phase started in 1991. Phase 3 that started in 1999, is difficult to capture in a VAR model, as the sample period is too short.

Figure 5: Reactions of sectoral output to an unexpected change in domestic credit



For the agricultural sector and the services sector, the results of the VAR analysis are quite plausible. The services sector, that was documented above to have the largest share in domestic credit was found to have the strongest response to changes in domestic credit, and the agricultural sector, the sector with the smallest share in domestic credit also displays the weakest reaction in the VAR.

The manufacturing sector, however does not react significantly, although with 22%, it receives a substantial share of total domestic lending. The explanation for the insensitivity of output in the manufacturing sector, to changes in bank lending may be found in the alternative sources of finance that is available to this sector. Manufacturing firms are typically larger than other firms, and can more easily participate in international trade, and thereby have access to international sources of finance.

Two graphs in the appendix of this paper suggest, that this is indeed the case. Figure A1 shows that the manufacturing sector receives by far the largest share of total foreign direct investment⁸, among all sectors (39%). It is also like to benefit from the development of direct financing on the domestic capital market. Figure A2 shows that the market capitalization of the stock market has increased from less than 10% in 2003 to values of 30-40% in recent years.

5. DISCUSSION: THE LINK BETWEEN FINANCIAL DEVELOPMENT, ECONOMIC GROWTH AND POVERTY

In the previous section, we have seen that the empirical link between output growth and domestic credit growth is quite different across the main sectors in Nepal. This is interesting in the context of the theoretical model of Tornell and Schneider (2004), referred to in the beginning of the analysis. It implies, that a model with a non-tradable sector, that is financed mainly via the domestic banking system, and a tradable goods sector, that has other forms of financing available is relevant for the economy of Nepal. A question of central importance for a country that struggles with issues of poverty, income inequality and high unemployment rates is what this finding implies for welfare of the economy as whole.

Before addressing this question, it is important to note, that growth itself, even if uniformly distribute across sector and individuals, is not a concept that can easily discussed in the context of the welfare question. To grow means to invest now to be able to consume more later. A high growth path necessarily includes an intertemporal decision, where an initial consumption is lower, and future consumption is higher. It is therefore not a Pareto improvement to have higher economic growth. It requires an intertemporal utility function, as well as the assumption that the initial period of reduced consumption (and increased investment) is sufficiently short, that a given generation eventually is able to benefit from the increased future consumption opportunities. Finally, it is important that in the initial period, it does not fall below a minimum income level that is needed to sustain a living. This is where international financial liberalization - that is not discussed separately from domestic financial development in this paper - may actually help.

Accepting these shortcomings, it is important to understand what financial development implies for key variables that go beyond the analysis of average annual growth rates. As always, data availability is an issue, but in the case of Nepal, a quite good data base exists in form the National Labor Force Survey (NLFS). The pattern of inequality across sectors and between rural and urban areas are also widely documented in the literature, for instance in recent studies of Wagle (2010) and Sharma (2010). The two tables below show that there is reason to be concerned about Nepal's recent development, despite the relative stability and growth performance it has recently achieved.

⁸ Note however that these data refer to approved commitments, rather than actual FDI. The Manufacturing share, however, is likely to be larger in the actual values as well.

The previous sections have documented that only a very small share of total domestic credit - 3% - is lent to the agricultural sector. Furthermore the agricultural sector does not display a positive significant reaction to increases in domestic credit and it may even be vulnerable to sudden exchange rate depreciation, as it does not benefit from the export-link to the exchange, and might be characterized by the phenomenon of currency mismatch.

Against this background, it is worrisome that more than 70% of the total population and up to 80% in rural areas are employed in the agricultural sector. Table 4 shows, that only in urban areas; this number is substantially lower, with a share of 32%. The manufacturing sector on the other hand counts only for 6.6% of total employment - again with a higher concentration in urban areas - and the services sector accounts for 15% of employment.

Table 4: Employment shares in main sectors

	Total	Urban	Rural
Agriculture	73.9	32.2	80.1
Manufacturing	6.6	14.0	5.5
Services	15.0	45.2	10.3
Other	4.5	8.6	4.1

Source: NLFS 2008, Table 7.6 and own calculations

The problem of the uneven participation of the workers is enforced by the fact that the agricultural sector, and rural areas in general are endowed with rather low income levels and wages, when compared to other professions. Table 5 shows that average monthly incomes vary considerably by occupation. The average monthly income across all occupations is NRs. 5,117. In agricultural sector, however, they are estimated to be only at 4,276 in subsistence agriculture and 4554 in market agriculture. These are clearly below average values, not taking into account yet, the high unemployment rates in regions, where agriculture is among the few employment opportunities.

Table 5: Average monthly income across occupations (in Rs.)

Total	5117
Legislators, senior officials	16142
Professionals	9484
Technician and assoc. profess.	6001
Clerks or office assistants	7243
Service workers	6246
Market agriculture	4554
Subsistence agriculture	4276
Craft and related trades workers	5186
Plant and machine operators	6248
Elementary occupation	3032
Armed forces	7222

Source: NLFS 2008, Table 7.13

6. CONCLUSIONS

In this paper we have investigated the link between financial development and output growth at the sectoral level. *Our main finding is that while services react positively to increases in domestic lending, both agriculture and manufacturing are largely unaffected.*

The services sector shows a positive response that increases in magnitude, when considering shorter (more recent) time intervals, starting from 1980, 1985, and 1990.⁹ The manufacturing sector, as well as agriculture show mainly insignificant reactions.

For the manufacturing sector and the services sector, the recent experience in Nepal is reminiscent of the patterns observed in a large cross section of other developing countries. The services sector is borrowing from the domestic banks, while the manufacturing sector has other financial instruments available, including foreign direct investment, as well as the domestic stock market. Accordingly the reactions of the services sectors to changes in domestic credit are more pronounced and we were able to identify this effect in set of simple bi-variate VAR regressions.

The agricultural sector, however, – that accounts for more than 70% of total employment - does not seem to participate proportionally in the increased investment opportunities that arise from financial development.¹⁰ We argue that it is important to take this empirical fact into consideration, when discussing the policy options of future changes in regulation and public policy related to financial sector development.

Our findings complement and strengthen related arguments on inequality and growth by Bajracharya (2006) and Sharma (2010).¹¹ They are also consistent with a formal analysis by Shrestha and Chowdhury (2007), who analyse the link between financial liberalization and growth in a autoregressive distribute lag (ARDL) model. Focusing on the difference between rural and urban income, they report a general positive impact on employment, but a negative impact on credit to rural areas and income distribution.¹²

⁹ This result is reminiscent of the findings by Gautam (2008) between tourism financing and economic growth. The tourism industry is a major part of total services.

¹⁰ Despite the efforts of the NRB, who directly and indirectly lends to the agricultural sector and rural credit co-operatives, the share of total bank lending to the agricultural sector by the major banks has only been 3%.

¹¹ Sharma (2010) also points to the uneven growth pattern across sectors and discusses the lack of access to credit in rural areas. He points out for instance that lending rates in agriculture are above the average. In the paper he highlights the importance of agriculture for the poverty alleviation.

¹² Note that their results refer to financial liberalization, rather than financial development, for instance as measured by real credit growth in our paper. However, as shown by Bhetuwal (2007), both concepts are closely related. The differential impact of rural and urban areas had also been pointed out by Acharya (2003). For aggregate GDP, a positive link between

Concrete proposals on how to include the agricultural sector in the ongoing process of financial development have been made for instance in Sharma (2003), who argues that there is a need for small credit co-operations to engage in lending to rural households and to support micro-finance.

Further research might go in several directions. First, the empirical analysis presented in this paper only constitutes a first step. A wide range of alternative specifications, control variables and identification schemes could be used to further evaluate the presented evidence. Also firm-level and bank level data would be very helpful to uncover the exact mechanism that is behind the aggregate, sectoral co-movements.

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APPENDIX

Figure A1: Decomposition of FDI by sector

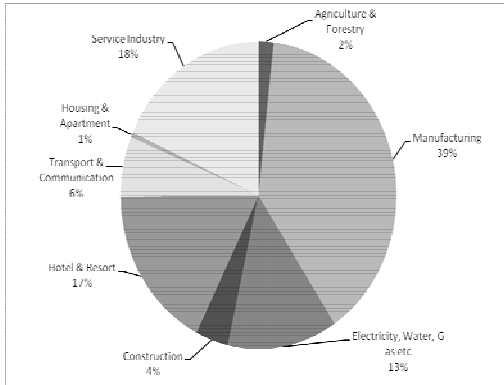
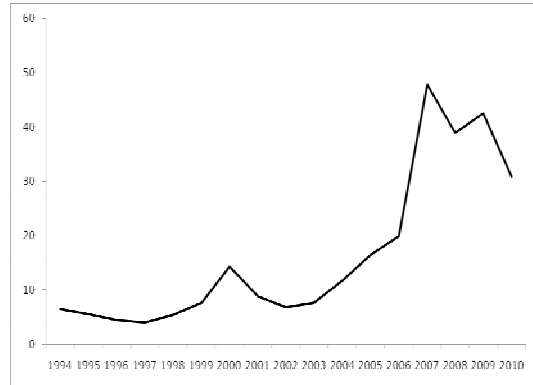


Figure A2: Market capitalization of listed companies (as a percentage of GDP)



Source: Department of industries, as in Rana and Pradhan (2005)

Figure A3: Sectoral lending (nominal) from 2007-2009 (cumulative percentage change)

