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Industrialization, employment and poverty

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INDUSTRIALIZATION, EMPLOYMENT AND POVERTY

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EXECUTIVE SUMMARY

1. To what extent does the manufacturing sector contribute to creation of jobs and the reduction of poverty in developing economies? Is it important to invest in manufacturing from the perspective of poverty reduction? These are the questions analyzed in this report. The report provides theoretical and empirical evidence on the continued importance of manufacturing as an engine of growth, employment creation and poverty reduction.

2. The impact of manufacturing on economic growth, and more broadly, on economic development, has been extensively studied in the literature. Less is known about the effects of manufacturing growth and industrialization on employment creation and poverty alleviation. This report provides an analytical review of the literature on the role of manufacturing along these three dimensions: contributions to economic growth, creation of employment and reduction of poverty. The report focuses on the specific contributions of the manufacturing sector, compared to those of other sectors. The purpose is to find out to what extent manufacturing plays a *special* role in each of these dimensions.

3. To frame the discussion of the literature, the report presents a simple analytic framework for the identification of the different channels through which growth in manufacturing output has an impact on employment creation and poverty alleviation. This framework has two main elements, namely a) job creation within given sectors and b) the evolution of earnings of workers in existing and new jobs, in relation to the earnings of the non-employed and earnings of workers in other sectors. The framework is formulated in abstract terms and subsequently applied to analyze the role and impact of growth in the manufacturing sector. The channels through which growth in manufacturing output affects employment and poverty can be classified into three categories: a. direct impacts, b. indirect impacts and c. induced impacts.

3.1 Direct impacts on employment and poverty

At given levels of labor productivity, growth in manufacturing output creates new jobs in the manufacturing sector. Given the higher productivity of manufacturing (as compared to many other sectors of the economy such as agriculture or the informal sector), these jobs tend to be well-paid and of good quality. Structural shifts in employment from low-productivity sectors (mainly agriculture) to manufacturing will thus have a positive effect on the incomes of the poor. The evidence reviewed shows that such direct effects are positive when growth of manufacturing is rapid, especially at lower levels of per capita income. However, there are limits to the direct effects of manufacturing on overall employment creation and poverty reduction, because fast productivity growth will slow down the direct creation of employment and because manufacturing only accounts for a modest proportion of the total employed labor force (between 16 and 20 per cent in 2005, with Taiwan as an outlier with 27 per cent). Given this low share it is inevitable that most employment creation will occur in other sectors.

3.2 Indirect impacts on employment and poverty:

Growth in manufacturing output also creates new jobs in other sectors of the economy, through indirect input-output linkages. Given the strong backward and forward linkages of the manufacturing sector with the rest of the economy, its employment generation potential is much larger than the jobs directly created. The literature reviewed tends to regard manufacturing as the sector with the strongest linkages and the largest employment multipliers of the economy. The evidence suggests that one job created in manufacturing will create a larger number of jobs in other sectors than one job created in any other part of the economy. The impact on poverty of this indirect effect, however, is less straightforward. It depends on the average wages and labor conditions of the sectors which are strongly linked with manufacturing. In general, however, one should expect a quite strong and positive impact of manufacturing growth on poverty through this channel. More research needs to be done on employment multipliers in developing countries.

3.3 Induced impacts on employment and poverty

Growth in manufacturing output also creates new jobs in other sectors of the economy due to induced effects, both in demand and supply. Induced impacts are external effects of investments in manufacturing, other than the linkage effects discussed in the previous section. From the demand side, the net increases in incomes received by the workers in the jobs directly or indirectly created through investment in manufacturing will be re-spent, generating *Keynesian-type* multiplier effects in the economy that will, in turn, contribute to higher demand, additional employment and –eventually– additional income for the poor. From the supply side, manufacturing is seen as playing a special role as engine of growth of the total economy, especially through knowledge spillover effects. By stimulating growth in this way, manufacturing would have additional impacts on overall employment and poverty alleviation.

4. The detailed review of the secondary literature on the poverty impacts of different sectors has shown that most of the contributions fail to capture all the various indirect and induced channels through which growth impacts on poverty. Most efforts in this regard have focused on estimating the so called *Poverty Elasticity of Growth (PEG)* at the sectoral level, and comparing the results across different sectors. This type of approaches, however, normally relies on econometric models that do not take into consideration the important interactions existing among the different sectors of the economy. That is, they concentrate mainly on the first channel (the direct impact) and disregard the important role of the other two channels (indirect and induced impacts). In particular, they do not sufficiently acknowledge the fact that if manufacturing is indeed one of the main engines of growth, then part of the poverty-alleviation effect of other sectors would be, in fact, a by-product of manufacturing growth.

5. A few studies have attempted to capture these indirect and induced inter-sectoral effects using decomposition techniques that are applied to Social Accounting Matrices (SAMs). These studies, however, are rather static in nature and thus, fail to capture the importance of long-run structural change for sustained poverty alleviation. The economic structure of the poorest countries is typically dominated by rural agriculture and urban informal services. It is therefore clear that in the short term growth in these sectors will have a positive immediate impact on the

income of the poor. On the other hand, the absence of structural change would inevitably imply that these countries would remain poor and that sustained reductions of poverty would not be possible.

6. Manufacturing and economic growth in developing countries

6.1 Engines of growth.

In the literature, manufacturing, in particular, has been regarded as one of the major engines of growth in the economy. In the 1950s it was consider as the main route to development. Over time, the service sector has gained in importance, increasing in terms of its share in the economy and in terms of its contribution to growth. Nevertheless, the evidence marshaled in this report provides qualified support for continued importance of manufacturing in low-income and middle-income developing countries. Using different estimation techniques, for different countries and different periods, a large body of empirical literature has concluded that the manufacturing sector remains one of the main drivers of economic growth. Neglect of investment in manufacturing would be a serious omission, also in the light of the most recent insights and recent literature.

6.2 Mechanisms

The following mechanisms explain the role of manufacturing as one of the important engines of growth:

- Manufacturing industries provide good opportunities for capital accumulation, which in turn, is one of the sources of economic growth;
- Labor productivity in manufacturing tends to be higher than in many other sectors. Expansion of manufacturing in low-income economies provides opportunities for static and dynamic productivity gains.
- Manufacturing industries provide opportunities to exploit economies of scale, and achieve productivity gains through learning-by-doing dynamics.
- Manufacturing industries are characterized by stronger backward and forward linkages with the rest of the economy. Investments in manufacturing indirectly affect many other sectors
- Manufacturing industries provide good opportunities to alleviate balance of payments constraints that can hinder economic growth in developing countries, both in terms of export potential and import substitution opportunities.
- Manufacturing provides special opportunities for technological progress. The empirical evidence clearly shows that manufacturing is the most important sector in terms of business R&D expenditures. Both with regard to shares in R&D and R&D intensity of production, manufacturing stands out as the sector where the most R&D investment is performed.
- Manufacturing industries have strong knowledge and technological spillovers to other sectors of the economy. According to the literature reviewed, these spillovers are typically larger than the spillovers generated by other activities. Of all the mechanisms discussed, technological progress and technology and knowledge spillovers are the most important ones.

6.3 Empirical findings

- Shares of manufacturing in GDP are positively related to economic growth, especially in low-income countries with higher levels of human capital.
- Manufactured exports seem to be even more important for growth than shares of manufacturing in GDP. Manufacturing exports are significantly related to growth in both low-, middle- and high-income economies.
- The recent literature indicates that other sectors such as services can also act as engines of growth, particularly in growth accelerations. But the general conclusion is that *new* engines of growth are emerging but without necessarily replacing the *old* ones.
- There are important positive interactions between growth of market services (e.g. distribution, retailing, financial services, software) and growth of the manufacturing sector.

7. Job creation

7.1 One should distinguish between the direct creation of jobs in manufacturing and the jobs indirectly created in other sectors. In advanced economies manufacturing employment is shrinking in absolute terms. In most developing countries manufacturing employment is still increasing, but there are important differences between countries. Employment creation is most marked in Asian economies. In China and to a lesser extent India there are huge increases in the numbers of persons employed in manufacturing.

7.2 Manufacturing jobs tend to be high quality jobs with higher wages and more indirect benefits.

7.3 Even in those countries where manufacturing employment is increasing in absolute terms, the shares of manufacturing in total employment are either stable or declining. Only in one or two exceptional cases has the share of manufacturing increased since 1995. In 2005 there were only four countries in a sample of 30 countries (namely Singapore, Malaysia, Italy and Taiwan), where the manufacturing sector accounted for more than twenty per cent of total employment. In most countries and most years, the share of manufacturing lies somewhere between 10% and 20% of total employment. The low shares of manufacturing in employment lead to the conclusion that while manufacturing can contribute to employment creation, this sector cannot absorb the supply of labor in developing countries. There is a limit to the role of direct employment creation in manufacturing. Other sectors will have to take up the slack.

7.4 The indirect effects of manufacturing are much more important, than the direct effects. On balance, the literature reviewed suggests that manufacturing tends to create substantial numbers of jobs in other sectors of the economy, through a variety of linkages. Employment multipliers are usually higher than those of other sectors. For every job created in manufacturing, the evidence suggests that in total two to three jobs are created. In micro-level studies, very high employment multipliers are found for expansion of manufacturing production capacity. Multipliers range from five to more than twenty indirect jobs for every job created in manufacturing.

7.5 An interesting question is why the multipliers obtained in micro-studies are higher the sectoral multipliers from macro-studies. The reasons for this are twofold. First, micro-studies tend to disregard cross-sectoral effects, which are captured better in macro-studies which take general equilibrium effects into account. They are partial equilibrium approaches. Second, firms and projects differ very much in the employment multipliers, which are averaged out in macro

studies. For the decision on which sectors to investment in – from the perspective of employment creation – macro studies are a good guide. On the other hand micro studies are of special importance for the decision in which specific activities one should invest.

7.6 The combined direct and indirect employment effects of manufacturing provide arguments for investment in manufacturing from an employment perspective.

7.7 Premature de-industrialization is a threat to employment, in particular through the indirect employment multipliers. For every job destroyed in manufacturing, more jobs will be destroyed in other sectors. In countries facing premature de-industrialization, the policy challenge is to make a switch towards re-industrialization.

8. Poverty alleviation

8.1 While there is a large literature on the poverty elasticity of aggregate economic growth, less is known about sectoral contributions to poverty reduction. The empirical literature on the impact of manufacturing and other sectors on poverty alleviation is quite limited. Moreover, most of the existing studies do not adequately capture the various channels through which sectoral growth impacts on poverty reduction.

8.2 Most efforts in the literature have focused on estimating the *Poverty Elasticity of Growth (PEG)* at the sectoral level, and comparing the results across different sectors. The literature suggests that in the short run a growth pattern that favors agricultural and informal activities is more effective in terms of poverty reduction than a growth strategy based on the secondary sector. But recent studies also document significant positive poverty reduction effects of growth in the secondary sector, especially in East Asia. The poverty reduction effects of the secondary sector are highest in developing countries with labor intensive growth.

8.3 The *Poverty Elasticity of Growth* approach focuses mainly on direct effects and disregards important inter-sectoral interactions that are at the core of the economic growth process. Some studies have tried to capture these inter-sectoral effects using Social Accounting Matrices (SAMs). Two SAM-based studies highlight the importance of the primary and agricultural sectors. One recent study on Vietnam points to the importance of manufacturing growth.

8.4 Like the poverty elasticity approach, the methodology using social accounting matrices of a given year is static in nature. While it provides valuable information about the channels through which sectoral growth affects poverty, it takes the structure of the economy as given and fails to recognize the importance of key structural change in poverty alleviation.

8.5 A strategy which focuses only on the improvement of low-income activities in agriculture sector cannot provide a way out of poverty traps. Structural change constitutes one of the major forces lifting countries and their populations out of poverty. Manufacturing industries play a key role in driving this structural transformation.

8.5 Given the better labor conditions typically offered by manufacturing industries (in terms of wages, indirect benefits and promotion opportunities), shifts in labor from low-productivity

activities (such as rural agriculture or informal services) to manufacturing have positive and persistent impacts on poverty alleviation.

8.6 The role of manufacturing in employment creation is particularly important at early stages of development. In the poorest countries, the expansion of labor-intensive manufacturing industries has major potential for poverty reduction through its direct impact on the creation of new, better quality jobs. Countries which have missed out on these opportunities are the countries that have experienced little economic growth.

8.7 In middle-income countries, the direct impact of manufacturing on poverty reduction through the creation of new jobs becomes less important. In these economies, the challenge is to sustain rapid growth. For these countries, a shift to high-tech and capital-intensive manufacturing industries becomes important. These industries are less labor-intensive, but provide more high-quality high-skilled jobs and have the greatest spillover effects for economic growth (thus indirectly inducing further reductions in poverty rates).

8.8 In comparative perspective, manufacturing has played an important role in accelerated catch up. The historical experiences of the successful cases of catching up (and thus, poverty reduction) demonstrate that relying only in low productive activities in agriculture or the informal sector does not constitute a pathway out of poverty traps. As extensively documented in the literature, rapid catching up goes hand in hand with a radical structural transformation of the economy towards activities with higher productivity and higher levels of technological sophistication. Well-known examples include Brazil, China, India, Malaysia, Indonesia, South Korea, Taiwan, Turkey or Vietnam, For these reasons, structural change constitutes one of the major forces leading countries out of poverty, and manufacturing industries play a key role in driving this structural transformation. Given the better labor conditions typically offered by manufacturing industries (in terms of wages, indirect benefits and promotion opportunities), shifts in labor from low productive activities (such as rural agriculture or informal services) to manufacturing will have a positive and persistent impact on poverty alleviation.

8.9 The impacts of the growth-enhancing effects of manufacturing on poverty reduction have been disregarded in much of the literature. If manufacturing is one of the important engines of growth – as argued in this report –, then growth in other sectors of the economy is partly driven by manufacturing growth. The positive impact on poverty that results from manufacturing-induced economic growth needs to be taken into consideration when evaluating the role of manufacturing on poverty alleviation.

9. In the 1950s and 1960s investment in manufacturing was seen as the key to economic development and poverty reduction. As time passed, the role of manufacturing increasingly came to be questioned. The focus on manufacturing had led to the neglect of other important sectors such as agriculture, with deleterious effects on overall economic development. In later years, the rise of market services in both advanced and developing countries made it clear that engines of growth can also be found in service sectors. As a result, in recent policy debates there is a now a tendency to underemphasize or even neglect the importance of manufacturing. This report provides theoretical and empirical evidence for the continued importance of manufacturing as an engine of growth, employment creation and poverty reduction.

Manufacturing plays this role in interaction with other important economic sectors such as agriculture and services. In the current debates about investment priorities and economic policies, manufacturing should continue to take a prominent place.

CONTENTS

1. INTRODUCTION

During the post-war period, there was consensus among development theorists that industrialization constituted the prime avenue for economic development. Manufacturing was identified as the main engine of economic growth, economic development and social progress. In recent years, however, the role of manufacturing has been challenged and questions have been raised concerning the continued importance of manufacturing for economic development, catch up and poverty reduction in developing countries. Some observers even argue that we live in an era of service-led growth

This report assesses the extent to which these challenges are justified, focusing on the role played by manufacturing with regard to the different dimensions of economic development: growth, employment creation and poverty reduction. The main question addressed in this report is whether or not manufacturing plays an important role in the process of economic growth, the creation of new employment and the alleviation of poverty in the least developed economies and in emerging middle-income countries. This report argues that manufacturing continues to be of considerable importance for economic development, employment creation and the reduction of poverty. Manufacturing is not the only sector of importance in developing countries of the present period. But the relative neglect of industrialization and industrial investment in modern policy debates is not justified. It is a sector which deserves special attention from policy makers and the financial community.

To address the questions posed above, this report provides an systematic analytical review of the existing literature regarding the impacts of manufacturing on growth, employment creation and poverty reduction. The secondary literature is not always unambiguous in its conclusions. We have tried to combine a balanced discussion of this literature, with the formulation of clear policy recommendations.

The report is structured as follows. In Chapter 2 we develop a simple analytical framework aimed at identifying the different channels through which growth of manufacturing output can have an impact on employment creation and poverty alleviation. This framework is used to structure the analysis of the existing literature. Given that one of the core elements of the framework is the special role of manufacturing as a major driver of economic growth, Chapter 3 reviews the literature on the so-called *manufacturing as engine of growth* hypothesis. Chapter 4 focuses on the role of manufacturing in employment creation. The role of manufacturing is compared with that of other sectors. Subsequently, Chapter 5 discusses research on the impact of manufacturing on poverty reduction. Again the role of manufacturing is compared with that of other sectors.

2. ANALYTICAL FRAMEWORK

Before analyzing the literature, it is important to identify the various channels through which output growth in a certain sector can be conducive to poverty alleviation. With this purpose, in what follows, we present a simple theoretical framework in which we detail the most important of those channels.

We begin by developing the framework for a generic case (certain sector *j*) and then we analyze the specific features that might give to manufacturing a special role in each of these channels.

2.1. THE GENERAL CASE

In broad terms, output growth in a given sector *j* will have a positive impact on poverty via three main channels:

- **Direct impact**: *Employment and incomes generated within the sector*.

  Given a certain capital-labor ratio and level of technology (labor intensity), growth of output in sector *j* will demand an additional number of workers. These additional workers could previously be: a) unemployed, b) employed in other sectors with lower levels of productivity than sector *j*. c) employed in other sectors with higher levels of productivity than sector *j*.

  In the first case (a), the direct impact on poverty reduction is positive and straightforward (except in the unlikely case that unemployment benefits are higher than the earnings in the newly created jobs).

  In the second case (b), the direct impact on poverty alleviation will be positive if productivity in sector *j* is higher than the productivity in the sectors where the workers come from, and if earnings reflect this productivity differential. That is, poor workers will manage to surpass the poverty line by "migrating" to a different sector.

  In the third case (c) the impact on poverty alleviation will be negative if productivity in sector *j* is lower than productivity in the sectors where the workers come from and if earnings reflect this productivity differential.

  Depending on the country setting, the final outcome will be determined by a combination of cases (a), (b) and (c.) That is, some of the additional workers in sector *j* would be previously unemployed, some would be employed in sectors with lower productivity than *j* and (possibly) some would be employed in sectors with higher productivity than sector *j*[2]. The net outcome of the direct effect on poverty alleviation, will thus depend on the proportions of workers in new jobs in sector *j* in the three categories.

  In addition to the direct impact via new jobs, we should also consider the direct impact of productivity gains on poverty reduction. If the productivity of the sector *j* is increased

[2] For instance, when new jobs are created in the informal sector, at the expense of higher productivity jobs in the formal sector.

(maintaining at least the same levels of employment), there will be a potential positive impact on poverty alleviation, as long as these productivity gains are later transferred into higher wages which enable some workers of sector *j* to surpass the poverty line and increase their welfare.

Productivity gains can potentially also have negative effects on poverty reduction, if workers are laid off as result of productivity gains, when demand for the sector's products does not increase rapidly enough. In this case one will have a positive effect for workers retaining their jobs with higher incomes and a negative effect due to workers losing their jobs and shifting to an unemployed status or to lower productivity sectors. Whether productivity gains actually result in shrinking employment, depends on whether demand increases rapidly enough to absorb the additional output created by productivity increases. This depends very much on the rate of growth of output of sector j.

- **Indirect impact**: *Employment and income generated in other sectors due to the linkages of sector j with the rest of the economy.*

  Output growth in sector *j* will generate additional jobs in other sectors *k* of the economy in accordance with its backward and forward linkages. Backward linkages, including subcontracting relationships, create jobs in other sectors *k* through increased demand for the intermediate outputs of other sectors, which are used as inputs in sector *j*. Forward linkages create jobs through the supply of cheaper or better inputs to other sectors, enabling these sectors to grow.

  The impact of these additional jobs on poverty alleviation will also depend on the previous earnings of the workers in these indirectly created new jobs, in the same way as the new directly created jobs examined in the previous bullet. We can again distinguish the three cases: a. the workers in new indirectly created jobs in sector *k* were previously unemployed b. the workers in the new indirectly created jobs in sector *k* were previously working in other sectors/activities with lower productivity and earnings than in sector *k*; c. the workers in new indirectly created jobs in sector *k* were previously working in other sectors/activities with higher productivity and earnings than in sector *k*.

- **Induced impact:** *Employment, productivity growth and income generated in other sectors due to the growth-enhancing character of sector j.*

  The contribution of a sector to aggregate growth, employment creation and poverty reduction can be substantially higher than the direct and indirect contributions which can calculated by accounting methods. If this is the case, the additional employment and income generated by this induced growth (and its impacts on poverty, calculated as described before) should also be attributed to sector *j*.

  The following mechanisms explain why a sector could be growth-enhancing (or an "engine of growth"):

  - Technological and knowledge spillovers. This effect goes beyond the direct linkages which can be traced in an input-output framework. It has to do with the externalities

associated with important knowledge and technology flows from manufacturing to other sectors.

- Income-induced effects: The additional incomes received by the direct and indirect workers associated with the expansion of output of sector *j* will be re-spent, generating *Keynesian*-type multiplier effects in the whole economy. This in turn contribute to higher demand, additional employment and –eventually– additional income for the poor.

  An important remark here is that growth in sector *j* could be itself the result of income-induced effects from other sectors. Thus, it is important to have a "general equilibrium approach" instead of a "partial equilibrium approach".
- Alleviation of external foreign exchange restrictions: If sector *j* is able to produce positive external surpluses, then it might alleviate Balance of Payments constraints that can hamper economic growth in developing countries.

If these mechanisms are in place, then expansion of a given sector may result in more rapid growth of the total economy. Given a positive growth elasticity of poverty - i.e. other things being equal an increase in income per capita is associated with a reduction of poverty - this will result in poverty reduction.

These are the main channels through which output growth in a given sector j can have a positive impact on poverty alleviation. In the following section (2.2) we go beyond the abstract argument and focus on the contributions of the manufacturing sector. We briefly summarize the arguments in support of the idea that manufacturing plays a special role through these channels.

2.2. THE CASE FOR MANUFACTURING

The following arguments have been given to stress the special role of manufacturing through each of these channels.

- **Direct impact:**

  Manufacturing jobs are typically associated with higher wages and better labor conditions than jobs in other sectors of the economy. This is mainly due to the fact that manufacturing industries have higher levels of labor productivity than other sectors. Therefore, reallocation of labor to manufacturing would normally have a positive effect on poverty alleviation. The productivity differentials are explained by four main factors:

  - Greater opportunities for capital accumulation;
  - Opportunities to exploit economies of scale;
  - Greater opportunities for embodied and disembodied technological change

- Better opportunities for acquisition of technology from abroad (related to previous bullet).

However, given the relative size and factor intensity of manufacturing (normally less labor intensive than other sectors, such as services or agriculture), its capacity to generate direct employment (and thus, alleviate poverty via this channel) remains limited.

- **Indirect and induced impact:**

The main impact of manufacturing on employment creation and poverty alleviation seems to be related to its indirect and induced effects. In particular,

- The manufacturing sector is seen as acting as one of the main engines of growth of the economy. This would be explained by its greater opportunities for productivity gains and its technological spillovers to the rest of the economy.
- The manufacturing sector is assumed to have higher "connections" with the rest of the economy than other sectors, and thus have a larger "pulling" potential. This would be explained by its stronger backward and forward linkages.
- The manufacturing sector is assumed to provide good opportunities to alleviate the external restrictions (balance of payment constraints) via manufactured exports and domestic substitution of key imported inputs.

3. MANUFACTURING AND ECONOMIC GROWTH

In order to be able to assess the indirect and induced contributions of manufacturing to employment creation and poverty reduction, we need to examine the role of manufacturing as a potential engine of growth.

Following Berry (2006) it is possible to distinguish two broad approaches among the studies that have analyzed the growth-enhancing role of manufacturing. On one hand, there are those authors who study the manufacturing-growth relationship using statistical or econometric techniques without necessarily trying to understand the underlying mechanisms. On the other hand, there are those authors who try to indentify and quantify the special mechanisms by which manufacturing would generate overall growth benefits (linkages, spillovers, income-induced effects, etc.). In this section we will review the current state of knowledge from each of these perspectives, considering both the contributions that supports and challenge the manufacturing as engine of growth hypothesis.

3.1. REVIEW OF EMPIRICAL EVIDENCE, MACRO PERSPECTIVE

The empirical literature that has analyzed this relationship from a macro perspective can also be divided into two main groups. The first group is constituted by a wide array of studies which have tested the so-called *Kaldor laws* for different countries, in different points of time and using different econometric tools. These laws have been first proposed by Nicholas Kaldor in his seminal work about the causes of the slow rate of growth in the United Kingdom (Kaldor, 1966), and can be summarized as follows (McCombie, 1983; Thirlwall, 1983):

i. The faster the growth rate of manufacturing output, the faster the growth rate of GDP;
ii. The faster the growth rate of manufacturing output, the faster the growth rate of manufacturing labor productivity (due to increasing returns);
iii. The faster the growth rate of manufacturing output, the faster the growth rate of non-manufacturing labor productivity (due to reallocation of labor).

The verification of one or all of these laws constitutes a clear indication about the special role played by manufacturing in terms of economic growth. The first law, in particular, has been normally associated in the literature with the *engine-of-growth hypothesis*, according to which the main engine of economic growth would be the manufacturing sector.

The studies in the Kaldor tradition focus on the growth of the manufacturing sector. The second group of studies has focused, instead, on testing the impact that the size of the manufacturing sector (proxied by its share on total GDP or employment) has on the economic performance of the economy. In the following sections we review each group of contributions.

3.1.1. KALDOR LAWS

After Kaldor's seminal contribution, some early attempts to econometrically test his first law for the advanced economies can be found in Cornwall (1977, 1976) and Cripps and Tarling (1973).

In general, these studies were based on the estimation of the following relationship using ordinary least squares (OLS) regression techniques:

$$\hat{Q}_T = \beta_0 + \beta_I \hat{Q}_m \tag{3.1}$$

where, $\hat{Q}_T$ and $\hat{Q}_m$ stands for total output (GDP) growth and manufacturing output growth respectively, and β_0 and β_I are parameters to be estimated. In these early approaches, a positive and statistically significant coefficient β_I was interpreted as evidence supporting the engine of growth hypothesis. The general conclusion was that manufacturing was indeed the main engine of growth in advanced economies.

This approach, however, was later criticized because manufacturing output is a component of GDP, and thus $\hat{Q}_m$ and $\hat{Q}_T$ are positively related by definition. To solve this problem, other authors proposed to replace equation (3.1) for the following equation:

$$\hat{Q}_T = \alpha_0 + \alpha_I(\hat{Q}_m - \hat{Q}_{nm}) \tag{3.2}$$

or directly:

$$\hat{Q}_{nm} = \gamma_0 + \gamma_I \hat{Q}_m \tag{3.3}$$

where, $\hat{Q}_{nm}$ stands for the growth rate of the non-manufacturing sector (which can be further divided into agriculture and services). Equation (3.2) relates the overall rate of economic growth with the excess of the rate of growth in manufacturing over the rate of growth of non-manufacturing sector. Equation (3.3), on the other hand, directly relates the growth of non-manufacturing sector with the growth of manufacturing. If manufacturing is indeed the engine of growth, then α_I and/or γ_I should be positive and significant.

Using this specification several authors have found empirical support for the engine of growth hypothesis in a wide arrange of contexts: country case studies (Turkey[3], Greece[4], U.S.[5], South Africa[6], Pakistan[7]), regional studies (Chinese regions[8], U.S. states[9]), and cross country studies (Asian NICS[10], Africa[11] and Developing countries[12]).

[3] Bairam (1991), period: 1925-1978.

[4] Drakopoulos and Theodossiou (1991), period: 1967-1988.

[5] Atesoglu (1993), period: 1965-1988.

[6] Millin and Nichola (2005), period: 1946-1998.

[7] Khan and Siddiqi (2011), period: 1964-2008.

[8] Hansen and Zhang (1996), period: 1985-1991.

[9] Bernat (1996), period: 1977-1990.

[10] Mamgain (1999), period: 1960-1988, Singapore, South Korea, Indonesia, Thailand and Mauritius.

[11] Wells and Thirlwall (2003), period: 1980-1996, 45 African countries.

An alternative approach to solve the spurious relationship identified in equation (3.1) is based on the use of Instrumental Variables (IV) techniques. The IV approach would solve the endogeneity problems associated with equation (3.1), and thus correct possible biases in the estimated parameters. This approach was first proposed in Fagerberg and Verspagen (1999). In their view, the engine of growth hypothesis would be confirmed if β_I is positive, statistically significant and larger than the share of manufacturing on GDP[13]. Based on a cross-country sample of 67 economies for the period 1973-1989, they estimated equation (3.1) using the IV two stages least squared method (2SLS) and found that manufacturing was typically the engine of growth in developing countries in East Asia and Latin America, but not in the advanced economies.

Kathuria and Raj (2009) used the same approach to analyze the relationship between manufacturing growth and output growth in Indian states between 1994 and 2005. They also found support for the engine of growth hypothesis and concluded that manufacturing is still functioning as an engine of growth in India, despite the continuous increase in the share of services in the last three decades.

More recently, Lavopa and Szirmai (2012) tested the engine of growth hypothesis for a sample of 92 countries between 1960 and 2010 using the same methodology. In line with the previous papers, they find that the coefficients associated with manufacturing are positive, significant and larger than the share of manufacturing on GDP in the subsample of developing economies, but not significant in the advanced economies (at least, after 1975). However, this paper identifies an important shortcoming in the methodology, namely, that the direction of causality of the spillovers may be undetermined. It is shown that a coefficient β_I higher than the share of manufacturing on GDP in equation (3.1) can be interpreted as support for the existence of intersectoral spillovers. But the direction of theses spillovers could be either way, from manufacturing to other sectors, or from other sectors to manufacturing. Although it is tempting on the basis of theory to interpret that the spillovers goes from manufacturing to the rest of the economy, the study concludes that a method to empirically test this direction is still needed in order to get conclusive evidence supporting the engine of growth hypothesis.

Some authors have tried to address this problem using different models and estimation techniques. Felipe (1998), for example, argues that the previous equations suffer serious econometric problems, because they lack of an explicit theoretical underpinning as they do not specify the underlying production function. Therefore he proposes a two-sector supply-side framework that allows one to model both the externality effect of manufacturing on the rest of the economy and the externality of the rest of the economy on manufacturing. If the engine of growth hypothesis applies, the former effect should be larger than the latter. Felipe tests this framework using data on Indonesia, Malaysia, Philippines, Singapore and Thailand for the period 1967 to 1992 and confirms the important role of manufacturing in the generation of

[12] Necmi (1999), period: 1960-1994, 45 Developing countries.

[13] If β_I is positive and significant but not larger than the share of manufacturing on GDP, then manufacturing growth would not have any special role pulling other sectors of the economy, and thus could hardly be considered the engine of growth of the economy. See Lavopa & Szirmai (2012) for further discussion on the subject.

growth in these economies. Pooling together the data of the five countries he finds that the manufacturing externality is ten times larger than the nonmanufacturing externality.

Other authors make use of cointegration techniques and Granger causality tests to analyze whether manufacturing growth explains non-manufacturing growth or it is the other way around. That is, they test the extent to which the past values of one sector's growth help to explain (or Granger cause) the present values of the other sector's growth. Díaz-bautista (2003) uses this technique to test the engine of growth hypothesis in the case of Mexico between 1980 and 2000. He finds that industrial output and real GNP are cointegrated and have a long-run relationship that, according to Granger causality test, has a bi-directional causality running from the growth of the industrial sector to the overall economic performance. According to the author, this evidence gives strong support to the engine of growth hypothesis for the Mexican case.

Tregenna (2007) applies the same technique to South Africa between 1970 and 2005, and finds that the direction of causality (according to Granger tests) would go from services to manufacturing but not the other way around. She stresses, however, that the lack of evidence of Granger causality from manufacturing to the rest of the economy should be understood in the context of the poor performance of South African manufacturing during that particular period. It is the weak performance of manufacturing that is responsible for the lack of a dynamic positive effect of manufacturing.

To sum up, the literature review in this section in general seems to support the Kaldorian hypothesis that manufacturing is the main engine of growth. Using different estimation techniques, for different countries and different points of time, a large body of empirical literature has found that the manufacturing sector is the main driver of economic growth.

3.1.2. MANUFACTURING SHARES

A related strand of literature has tested the importance of manufacturing in the development process by focusing in the shares of this sector in total GDP instead of its growth rates.

This empirical strategy is adopted by Fagerberg and Verspagen (2002) who examined the impact of manufacturing and services GDP shares on economic growth in three different periods (1966-72, 1973-83 and 1984-95), for a sample of 29 countries. They find that manufacturing has a positive and significant impact on economic growth, but mainly before 1973. Their interpretation of these results is that the first period offered special opportunities for catch-up through the absorption of mass production manufacturing techniques from the US. After 1973, however, information and communication technologies (ICTs) started to become more important as a source of productivity gains, and these technologies are no longer within the exclusive domain of manufacturing, but also operate in the service sector.

In a similar vein, Rodrik (2009) analyzed the impact of the industrial GDP share on per-capita growth for a large sample of countries between 1960 and 2004, using instrumental variables techniques. He finds that the industrial share in GDP has a positive and significant impact on

economic growth, and that this impact is even more important than the impact of the country's export orientation.

More recently, Szirmai and Verspagen (2011) have also examined the relationship between the share of manufacturing in GDP and average growth rates of per capita GDP using panel data techniques for a sample of 90 countries between 1950 and 2005. For the whole period, they find a moderate positive impact of manufacturing on economic growth in line with the engine of growth hypothesis. However, when the period is split into three subperiods (1950-70, 1970-90, 1990-2005), the direct effects of manufacturing on growth are only found for 1970-1990. This paper also provides interesting insights based on the inclusion of some interaction terms in the regressions. On one hand, it is found that the interaction between educational level and manufacturing shares has positive and significant effects on growth in all subperiods, suggesting that the role of manufacturing critically depends on the absorptive capacities of the country. On the other hand, it is found that the interaction between manufacturing shares and the GDP per capita relative to the US (a proxy for technology gaps) has a significant negative sign in all three subperiods, implying that manufacturing is especially effective as a growth engine in the earlier stages of economic development.

Combining the two interaction terms in the regression leads to the conclusion that there is a positive effect of manufacturing on growth in countries with a highly educated workforce. This effect is found at different levels of income, but manufacturing has most effects on growth at low-income levels. Such effects are found for different subperiods, but the paper also suggests that the route to growth via manufacturing is becoming more difficult over time. Ever greater amounts of human capital are required to achieve the same positive effects of expanding manufacturing. Some countries at intermediate levels of development no longer benefit from manufacturing as an engine of growth.

Lavopa and Szirmai (2012) have extended the analysis of the previous paper, using the same dataset but now adding the share of manufactured exports in total exports as an explanatory variable. The preliminary results of this research indicate that manufactured exports play a more important role in explaining growth than the share of manufacturing in GDP as such. The coefficients of manufactured exports are highly significant and the signs are more than twice as large than those of the share of manufacturing in value added. A very important finding is that the effects of manufactured exports also hold for advanced economies at higher levels of GDP per capita.

3.2. SPECIFIC CHANNELS

In this section, we analyze the literature that has tried to identify and quantify specific mechanisms by which manufacturing would generate overall growth benefits. Following Section 2.2, the following mechanisms will be reviewed: a) capital accumulation; b) scale economies; c) structural change; d) linkages; e) external restrictions; f) technological progress; and g) technological spillovers.

Capital accumulation

Being a spatially concentrated activity, manufacturing would offer better possibilities for capital accumulation and capital-intensification than, for example, spatially dispersed agriculture. Capital accumulation is one of the important sources of growth. Historically most accumulation of capital has taken place in the manufacturing sector.

Some empirical evidence in this regard is provided in Szirmai (2011). Based on data of World Bank and Groningen Growth and Development Centre, sectoral figures on capital stock per worker are put together for both advanced and developing countries between 1970 and 2000. According to these estimates, in developing countries the capital-intensity in manufacturing is much higher than in agriculture, and also higher than the average for the total economy. Thus, shifts from agriculture to manufacturing would have an important role in the process of aggregate capital accumulation.

The importance of manufacturing as the sector driving capital accumulation in developing countries, however, has declined over time, as other sectors have become more capital-intensive. In the advanced economies, the capital intensity of agriculture is even substantially higher than in manufacturing. This is most likely due to the process of 'industrialization of agriculture' in which machinery replaces human inputs in the production process. Nevertheless, as the share of agriculture in total employment in the advanced economies is very low, the total contribution of agriculture to capital accumulation remains limited.

Scale economies

Compared with services and agriculture, the industrial sector has historically profited from economies of scale, which would be explained partly by the nature of technologies that are most productively applied in large scale production, and partly by the learning-by-doing kind of dynamics (Szirmai, 2011).

This is the point stressed in the second Kaldor Law (See Section 3.1.1), according to which manufacturing productivity would positively depend on the growth rate of manufacturing output. As we have previously seen, this law (together with the others) have been extensively examined in the empirical literature. The relationship seems to hold using different estimation techniques in different contexts[14].

Structural change

Given the mechanisms reviewed before, labor productivity in manufacturing industries would typically be higher and more dynamic than in other sectors of the economy. In this context, shifts of resources towards manufacturing would lead to static and dynamics gains in terms of the overall performance of the economy.

In Szirmai (2011) detailed evidence on this regard is provided for a sample of 16 developing countries during the post war period. It is shown that in most of these countries, the level of value added per worker in manufacturing is much higher than in agriculture and services

[14] An extensive review of studies which have tested this law can be found in McCombie et. al. (2002).

(except in Latin America between 1950 and 1970). In addition, it is shown that manufacturing is one of the most dynamic sectors in terms of productivity and output growth, especially in the period 1950-1973. After 1973, however, productivity growth in agriculture comes to surpass that of manufacturing. But this productivity growth takes place in a sector that is shrinking. In terms of growth of output, but manufacturing has far higher growth rates than agriculture and on average also higher growth rates than the economy as a whole.

Linkages

This mechanism refers to the direct input-output relations of inter-sectoral supply and demand. Two main types of linkages are distinguished in the literature: Backward linkages, which are related to the derived demand from inputs, and forward linkages which are related to the use of outputs by other sectors.

Early references analyzing the backward and forward linkages in the economy have stressed that these linkages are much stronger in manufacturing than in mining, or agriculture, which are typically characterized by weak connections with the rest of the economy (Cornwall, 1977; Hirschman, 1958; Myint, 1980). This notion has been confirmed by several studies based on input-output techniques[15].

External restrictions

Another mechanism that has been highlighted in the literature is the role of manufacturing in alleviating the balance of payments constraints that can hinder economic growth in developing countries (Palma, 2005; Tregenna, 2007, 2008). In this sense, it is argued that "*...if a sector is a net generator of foreign exchange, it may contribute to growth, as the foreign exchange surplus can increase investment in the economy as well as providing the foreign exchange needed for imported inputs into other productive activities in the economy. By mitigating balance of payments constraints on other sectors of the economy, sectoral growth that generates net foreign exchange can facilitate a reallocation of resources across the economy in a manner that supports higher growth*" (Tregenna, 2007, p. 26)

The earlier literature focused mainly on the important role of the manufacturing sector in producing manufactured goods that otherwise would need to be imported and might cause shortage of foreign exchange leading to macroeconomic crisis. Singh (1977), for example, argues that in developing countries at early stages of development, agriculture might have a more important contribution to the balance of payments than manufacturing. However, as per capita income rises, the role of manufacturing in maintaining external equilibrium becomes critical. According to the author, given the high income-elasticity of demand for manufacturing products, if this demand cannot be met from domestic sources, then there would be an increasing burden of manufactured imports on the trade balance.

Recent contributions tend to emphasize more the important role of manufacturing exports. Cimoli et. al. (2009) and Gouvea and Lima (2010), for example, examine this issue based on

[15] See ten Raa (2005) and Miller and Blair (2009) for extensive reviews on the literature that have used Input-Output techniques to measure inter-sectoral linkages and to identify key or strategic industries.

Thirlwall's balance of payments constrained growth model in a multisectoral framework. Their findings suggest that manufacturing (especially technology-intensive industries) provide better opportunities to alleviate the external restrictions due to its higher income-elasticity of demand for exports. This research is consistent with the empirical findings of Lavopa and Szirmai (2012) on the importance of manufactured exports for growth discussed in section 3.1.2.

Technological progress

Perhaps the most powerful arguments for the special role of manufacturing in economic growth are related to technological change. Manufacturing is seen by many authors as offering special opportunities for both embodied and disembodied technological progress (Szirmai, 2011). While the former is closely linked to the argument of capital accumulation (as long as rapid capital accumulation in manufacturing is associated with new capital goods that embody the latest state-of-art technology), the latter refers to changes in the knowledge of product and process technologies in firms and in the economy as a whole.

The key importance of manufacturing in technological progress becomes visible when we look at the distribution of R&D expenditures across major sectors of the economy. In Table 1 we have complied data on R&D by sector for the year 2008 in a sample of 36 countries. The table clearly shows that, for the majority of these countries, the bulk of R&D is undertaken in the manufacturing sector.

Table 1. *R&D Expenditures and relative intensity by major sector of the economy in the year 2008*

Country	Sectoral shares in R&D expenditures (% of Total Business Enterprises R&D)				Relative sectoral R&D intensity (R&D intensity of the total economy = 1)			
	Agric.	*Manuf.*	*Mining, Const. & Utilities*	*Serv.*	*Agric.*	*Manuf.*	*Mining, Const. & Utilities*	*Serv.*
Australia	1%	27%	30%	**42%**	0.4	2.6	**3.1**	0.5
Austria[(1)]	0%	**70%**	1%	29%	0.0	**3.4**	0.1	0.4
Belgium	1%	**65%**	1%	33%	0.9	**4.2**	0.2	0.4
Canada	1%	**47%**	8%	44%	0.3	**3.9**	0.4	0.7
Chile	4%	20%	4%	**72%**	1.1	**1.7**	0.1	1.2
China[(1)]	1%	**87%**	6%	6%	0.1	**2.6**	0.4	0.1
Czech Republic	0%	**65%**	2%	33%				
Estonia	0%	23%	3%	**73%**				
Finland	0%	**80%**	1%	19%	0.0	**3.6**	0.1	0.3
France[(1)]	1%	**84%**	3%	12%	0.6	**6.7**	0.3	0.2
Germany	0%	**89%**	0%	10%	0.2	**3.9**	0.1	0.1
Greece[(1)]	0%	46%	1%	**53%**				
Hungary	2%	**73%**	0%	25%	0.4	**3.3**	0.1	0.4
Iceland	0%	47%	4%	**48%**	0.1	**3.6**	0.3	0.7
Ireland[(2)]	0%	**66%**	0%	34%	0.1	**2.9**	0.0	0.5
Italy	0%	**71%**	3%	26%	0.0	**3.9**	0.3	0.4
Japan	0%	**87%**	2%	11%	0.0	**4.4**	0.2	0.2
Korea	0%	**89%**	3%	8%	0.0	**3.2**	0.4	0.1
Luxembourg[(1)]	0%	42%	0%	**58%**	0.0	**4.6**	0.0	0.7
Mexico[(1)]	0%	**69%**	1%	29%	0.0	**3.8**	0.1	0.5
Netherlands[(1)]	1%	**73%**	2%	23%	0.6	**5.2**	0.2	0.3
New Zealand[(2)]	0%	**52%**	0%	41%	0.0	**3.4**	0.0	0.6
Norway	3%	**43%**	13%	41%	2.4	**4.8**	0.4	0.8
Poland[(1)]	3%	**61%**	7%	28%	0.8	**3.2**	0.6	0.4
Portugal	0%	35%	8%	**57%**	0.1	**2.4**	0.8	0.8
Romania	14%	**44%**	15%	28%	2.0	2.1	**3.5**	0.4
Russian Federation	1%	17%	2%	**80%**	0.1	1.0	0.1	**1.3**
Singapore	0%	**73%**	0%	27%	0.0	**3.6**	0.0	0.4
Slovak Republic	1%	**63%**	0%	36%	0.3	**2.7**	0.0	0.6
Slovenia	0%	**86%**	1%	13%	0.0	**3.9**	0.1	0.2
South Africa	2%	**39%**	24%	35%	0.1	**2.4**	2.0	0.7
Spain	1%	**52%**	6%	41%	0.4	**3.6**	0.4	0.6
Switzerland	0%	**77%**	0%	13%	0.0	**3.8**	0.0	0.2
Turkey	0%	**64%**	1%	35%	0.0	**3.5**	0.1	0.5
United Kingdom	1%	**74%**	1%	25%	0.8	**6.3**	0.1	0.3
United States[(1)]	0%	**70%**	0%	30%	0.0	**5.1**	0.0	0.4

(1) Refers to year 2007; (2) Refers to year 2005.

Note: The relative R&D intensity is computed dividing the sectoral shares of R&D by the sectoral shares of GDP. Formally: $Relative\ R\&D\ intensity_{ij} = \left(R_{ij}/R_j\right)/\left(Y_{ij}/Y_j\right)$; where R_{ij} stands for the R&D expenditures of sector *i* in country *j*, R_j is the total R&D expenditures of country *j*, Y_{ij} is the Value Added of sector *i* in country *j*, and Y_j is the GDP of country *j*.

Source: Own elaboration based on OECD ANBERD database and World Development Indicators Database.

In 28 out of 36 countries in table 1 (exceptions are Australia, Chile, Estonia, Greece, Iceland, Luxembourg, Portugal and Russia), manufacturing accounts for the largest share of the R&D expenditure undertaken by business enterprises. If we take the large share of services in the GDP of advanced economies into account, the R&D intensity of manufacturing becomes even more pronounced. This can be observed in the second panel of Table 1, which shows the relative R&D intensity of each sector. That is, how large is the sectoral R&D per unit of value added as compared with the R&D per unit of GDP at the aggregate level of the economy. The figures clearly demonstrate that the R&D intensity in manufacturing is much higher than in any other sector in all but three of the countries of the sample.

Knowledge and Technology Spillovers

The effect of technological and knowledge spillovers from manufacturing to other sectors of the economy has also been highlighted as one of the major channels through which manufacturing industries would fuel overall economic growth. As we have previously indicated, empirical evidence points at manufacturing as being one of the primary sources of technological advance in the economy.

The large participation of these industries in total R&D expenditures shown in Table 1 is quite illustrative in this regard. As it has been widely documented in the literature, this type of investment has positive externalities that go far beyond the productivity gains achieved in the same sector. Several approaches have been proposed to empirically measure this type of spillovers, and in all cases, its important role in terms of increasing the total factor productivity of the economy has been highlighted[16].

Park (2004) has specifically analyzed the impact of intersectoral R&D spillovers between the manufacturing and non-manufacturing sectors based on a pooled time series data set of 14 OECD countries and three East Asian NIEs over the period 1980 to 1995. He found an important asymmetry in these intersectoral spillovers. While manufacturing R&D is shown to have a strong spillover effect on non-manufacturing TFP, non-manufacturing R&D investment does not have any significant impact on the cross sector productivity. Given these positive spillover effects, the study concludes that the social return to manufacturing R&D is two to six times greater than the private returns in the manufacturing sector alone.

Technological spillovers from manufacturing have also been examined looking directly at the sources of total factor productivity growth in a general equilibrium framework. That is, considering all the positive feedbacks existing between the various sectors of the economy, and trying to identify which among them are the most important in terms of technological spillovers to the others. Ten Raa and Wolff (2000) provide a pioneer methodology in this regard. They argue that R&D influences TFP growth in other sectors via an indirect channel. In their view, for R&D to spill over, it must first be successful in the home sector. Hence, they try to identify which sectors transmit technical change more strongly by looking at the interdependence of sectoral TFP growth rates in a system of equations that account for the spillover effects. Based on information taken from the US input-output tables for the years 1958, 1967, 1977 and 1987, they

[16] See Wolff (2011) for a recent review on the literature on this topic.

apply this method and find that the top industries in terms of technological spillovers all belong to the manufacturing sector[17]. These manufacturing industries are, according to the authors, the main engines of growth of US economy between 1958 and 1987.

In a similar vein, Pieper (2002) argues that "... *while the capacity to innovate and to realize the potential of new technologies is one of the main sources of economic growth, it is the diffusion of these new products and processes across firms, industries and countries that leads to widespread increases in productivity and economic welfare*" (*ibid.*, p. 1). In his view, the diffusion of technological growth across economic activities can be conceptualized as a process based on learning that leads to positive externalities; that is, productivity-increasing effects that are realized in economic activities outside the source activities. In order to capture these effects, he proposes a model based on a modified version of the second Kaldor law previously mentioned. In this model, the productivity growth of each sector depends on the output growth of that and all the other sectors of the economy. Formally,

$$\hat{p}_{jkt} = \propto_0 + \beta \hat{Q}_{ikt} \qquad (3.4)$$

where, $\hat{p}$ and $\hat{Q}$ stand for productivity growth and output growth respectively, *i* and *j* are sectors, *k* is the country and *t* the time.

The estimation of this relationship for each sector provide a matrix of coefficients that measures every sector's potential as source of technological growth resulting from sectoral learning spillover as well as its potential to absorb the spillovers from all the other sectors in the economy.

The matrix of coefficients is estimated using a cross-country panel data set of 47 countries compiled using internationally compatible time-series data at one-digit level of the ISIC between 1950 and 1998. The results of this analysis confirm a distinctive role for upstream production activities, especially manufacturing, as a source of technological diffusion. In words of the author, "...*the estimation results suggest manufacturing as the sector that is most consistently linked with all other main activities in the economy. The statistical regularities reported (...) show a robust long-run association for manufacturing both as a source of as well as a receiving sector for learning spillovers*" (*ibid.*, p. 25)

3.3. CRITICAL VIEWS

Two important trends of the last decades have led several authors to challenge the idea that manufacturing is the main engine of economic growth. In the first place, the phenomena of de-industrialization witnessed in advanced and –importantly– in many developing economies have

[17] From a total of 68 sectors the following manufacturing industries rank as the top ten in terms of technological spillovers to the rest of the economy: 1) *Computer and office equipment;* 2) *Electronic components;* 3) *Plastics and synthetics;* 4) *Scientific and control instruments;* 5) *Aircraft and parts;* 6) *Audio, video and communication equipment;* 7) *Drugs and cleaning products;* 8) *Motors vehicles;* 9) *Rubber, miscellaneous plastics; and* 10) *Household appliances.* (ten Raa & Wolff, 2000, pp. 485, Table 3)

raised doubts about the capacity of manufacturing to drive economic development in the current context of globalization. In this sense, it has been suggested that the increasing competition in world trade (with rapid growth in exports from China) and the increasing requirements in terms of technological capacity to match the quality standards required by world markets, are making increasingly difficult for developing countries to achieve rapid growth through industrialization, and especially through export oriented activities (Sheehan, 2008).

In the second place, the so-called ICT revolution has conferred a renewed importance to certain industries within the service sector as major drivers of economic growth, casting doubts about Baumol's hypothesis that services are stagnant sectors in terms of productivity gains.

Spithoven (2000), for example, challenges the idea that services are less productive than manufacturing. He argues that many services (such as Communications, transportation and health care) are as large-scale, as capital-intensive and as thoroughly grounded in technology, as manufacturing. Furthermore, he stresses that due to measurement problems, productivity in services might be underestimated while productivity in manufacturing might be overestimated.

Similar arguments are used to explain the fact that certain branches of services (mainly those related to ICTs) have shown rapid productivity growth in the last decades. Wölfl (2003) suggests that one possible reason for this dynamism is related to the presence of increasing returns to scale. In her view, ICT-related services might have increasing returns due to network effects on the production and use of ICT technologies.

The positive impact of ICT services on overall productivity has also been highlighted by several empirical studies, both for the US and the European Union (Bosworth and Triplett, 2007; Inklaar, et al., 2005; O'Mahony and Ark, 2003; Stiroh, 2001; Triplett and Bosworth, 2003; van Ark and Piatkowski, 2004).

In the light of these trends, some authors advocate a service-led development strategy, in which services –instead of manufacturing– would be the main engine of growth. This strategy is typically grounded on the experience of India, where the explosive growth of ICT related services has been the main driver of rapid economic growth. In this line, Dasgupta and Singh (2005) argue that "*... because of the new technological developments and other factors, services may in the future replace industry as the engine of growth, even in developing countries. In that sense, India may be regarded as pioneering a new development path which gives primacy to services rather than to manufacturing as the leading sector*" (*ibid*, p. 1037).

Recent studies aimed at testing the Kaldor's law seem to support the idea that services are gaining importance in driving economic growth. Using different econometric techniques and different country-samples it has been found that certain segments of the service sector act as well as drivers of economic growth (Acevedo, et al., 2009; Chakravarty and Mitra, 2009; Dasgupta and Singh, 2006; Felipe, et al., 2009).

Using a modified version of the traditional shift-share analysis, Timmer and de Vries (2008) analyze the direct sectoral contributions to growth. They apply this methodology to a sample of 19 countries in Asia and Latin America spanning the period 1950 to 2005. First, they find that growth accelerations are mainly explained by productivity increases within sectors than shifts

between sectors. According to their results, market services and manufacturing are the major contributors to growth accelerations, but of these two market services are the most important. According to the authors, this challenges common wisdom regarding the lack of productivity growth in the services sector. In periods of moderate growth manufacturing is the main contributor to aggregate productivity growth, with three quarters of the production coming from within sector productivity improvement.

In this ongoing debate, there are also strong counterarguments. In recent comparisons of the comparative performance of India and China it is argued that China by far outperforms India, especially because its growth is driven by manufacturing, while services play a more important role in India (see Ramani and Szirmai, forthcoming; Naude, et. al., 2012).

Advances in ICT allow for the emergence of new modes of industrialization in global value chains. Global value chains are distributed chains of production, where certain different activities are relocated to different countries in the light of these countries' local capabilities. In some ways this makes industrialization easier, as a country does not have to develop a complete supply chain on its own (e.g. Naudé and Szirmai, 2012). Thus advances in ICT create new opportunities for the emergence manufacturing in developing countries – labor intensive manufacturing in the low-income countries and high-value added activities in middle-income countries.

It is also important to bear in mind that technological advances in software and ICT services are not possible without advances in ICT hardware (silicon technologies, data storage, data transport and data infrastructure), and that manufacturing is still responsible for the greater part of R&D expenditures (Lavopa and Szirmai, 2012).

Most of the studies reviewed in this chapter also recognize the continued important role played by manufacturing industries (e.g. Timmer and de Vries 2008). The general conclusion seems to be that *new* engines of growth are emerging but without necessary replacing the *old* ones. It seems that the two-way interactions between services and manufacturing are of crucial importance for economic development (e.g. Andreoni and Gomez, 2012).

From this analysis, we may conclude that manufacturing is no longer the sector that exclusively drives growth. It remains one of the important engines of growth and it drives growth in interaction with other sectors such as market services, in a balanced growth path relationship. From this perspective, neglect of manufacturing investment would be a serious omission, also in the light of the most recent insights and literature.

Via its indirect and induced effects, manufacturing remains one of key sectors of economic growth in developing countries (Szirmai, Naudé and Alcorta, 2013). Through its positive effects on growth and employment creation in the total economy, a dynamic, successful and outward looking manufacturing sector will indirectly make an important contribution to declines in the number of people in poverty.

3.4. SUMMARY OF FINDINGS

The findings of this chapter can be summarized as follows:

- In the literature, manufacturing, in particular, has been regarded as one of the major engines of growth in the economy. In the 1950s it was consider as the main route to development.
- Over time, the service sector has gained in importance, increasing in terms of its share in the economy and in terms of its contribution growth.
- Nevertheless, the evidence marshaled in this report provides qualified support for continued importance of manufacturing in low-income and middle-income developing countries. Using different estimation techniques, for different countries and different periods, a large body of empirical literature has concluded that the manufacturing sector remains one of the main drivers of economic growth.
- Several mechanisms explain the role of manufacturing:
  - Manufacturing industries provide good opportunities for capital accumulation, which in turn, is one of the most important sources of economic growth;
  - Labor productivity in manufacturing tends to be higher than in many other sectors. Expansion of manufacturing in low-income economies provides opportunities for static and dynamic productivity gains.
  - Manufacturing industries provide opportunities to exploit economies of scale, and achieve productivity gains through learning-by-doing dynamics.
  - Manufacturing industries are characterized by stronger backward and forward linkages with the rest of the economy. Investments in manufacturing indirectly affect many other sectors
  - Manufacturing industries provide better opportunities to alleviate balance of payments constraints that can hinder economic growth in developing countries, both in terms of export potential and import substitution opportunities.
  - Manufacturing provides special opportunities for embodied and disembodied technological progress. The empirical evidence clearly shows that manufacturing is the sector with the highest shares in business R&D expenditures. The R&D intensity of production in manufacturing also tends to be higher than in other sectors. Manufacturing is closely associated with technological advance.
  - Manufacturing industries have strong knowledge and technological spillovers to other sectors of the economy, and – according to the literature reviewed – these spillovers are typically larger than the spillovers generated in other activities. Thus the technological knowledge generated in manufacturing will have positive effects on technological advance in other sectors
- Shares of manufacturing in GDP are positively related to economic growth, especially in low-income countries with higher levels of human capital.

- Manufactured exports seem to be even more important for growth than shares of manufacturing in GDP. Manufacturing exports are significantly related to growth in both low-, middle- and high-income economies.
- The recent literature indicates that other sectors such as services can also act as engines of growth, particularly in growth accelerations. But the general conclusion is that *new* engines of growth are emerging without necessarily replacing the *old* ones.
- There are important positive interactions between growth of market services (e.g. distribution, retailing, financial services, software) and growth of the manufacturing sector.
- Via its positive effects on growth and catch up, manufacturing contributes significantly to growth, and via growth to employment creation and poverty reduction.
- Neglect of investment in manufacturing would be a serious omission, also in the light of the most recent insights and recent literature.

4. MANUFACTURING AND EMPLOYMENT CREATION

In this chapter we review the current state of knowledge regarding the role of manufacturing in job creation. Following the analytical framework developed in chapter 2, we distinguish two main categories of contributions: those that emphasize the direct impacts of manufacturing on employment creation, and those that stress the indirect and induced impacts that manufacturing growth has on employment creation in other sectors of the economy.

4.1. DIRECT EFFECTS

The manufacturing sector has been regarded by various scholars as an important source of good quality jobs. Bivens (2003), for example, writes that "*...manufacturing has historically been a primary source for middle-class jobs characterized by decent wages and benefits, especially for workers without a college degree*" (*ibid*. p. 3). In a similar vein, Tregenna (2008) identifies various reasons why manufacturing jobs may be regarded as more desirable than jobs in other sectors of the economy. In her words, "*Blue-collar manufacturing jobs generally tend to be better paid and to develop higher levels of skills than equivalent jobs in the rest of the economy. Employment security in manufacturing tends to be superior to that in agriculture or services, and there is lower scope for and actual trends towards casualisation, outsourcing and other forms of atypical employment (at least domestically). Manufacturing is also easier to unionise than is agriculture and many services sectors, making manufacturing an important mainstay of trade union organisations.*" (*ibid*. p 460-61).

In a recent article, Dani Rodrik also emphasizes the important role played by the manufacturing sector in absorbing workers with modest skills and providing them with stable jobs and good benefits. In his view, the manufacturing sector is where the world's middle class *take shape and grow*. He stresses that "*Without a vibrant manufacturing base, societies tend to divide between rich and poor – those who have access to steady, well-paying jobs, and those whose jobs are less secure and lives more precarious*" (Rodrik, 2011, p. 1).

These features of the manufacturing sector have been empirically analyzed for recent years in the U.S economy in Helper et al. (2012). In this study, the authors analyze the wage differentials between manufacturing and non-manufacturing sectors and find that weekly earnings in manufacturing are, on average, 20% higher than the non-manufacturing average. Since these earnings depend on a variety of characteristics of the workers, the authors also use econometric techniques to control for the worker and job characteristics that influence earnings. After taking these characteristics into account, the weekly wages in manufacturing are on average still 8.4% higher than the wages in non-manufacturing sectors.

In addition to the wage premium, manufacturing also is more likely to provide better employee benefits than non-manufacturing, including retirement plans, paid holidays, life insurance, health insurance and paid vacations. Manufacturing wages and benefits are higher than in other sectors of the economy because manufacturers need to ensure that their workers are appropriately skilled and motivated. There are two reasons for this. First, the costs of downtime

in manufacturing are higher than in other sectors; and second, the large scale of manufacturing establishments makes it difficult and costly for factory managers to control the work process.

The authors also stress that once education levels are controlled in the estimates, the results show that low-wage workers benefit the most from manufacturing jobs, while high-wage workers benefit the least, indicating that manufacturing helps to reduce wage gaps between high-, middle- and low-wage workers. In addition, manufacturing would provide a disproportionately high number of jobs for less-educated workers. For these reasons, the authors conclude that manufacturing is "*... and engine for boosting those* [less-educated] *workers into the middle class*" (Helper et al., 2012, p. 5).

Ricaurte (2009) finds similar results for the US economy. Using harmonized data from yearly population surveys between 1968 and 2008, he finds intersectoral wage differentials that go beyond the differences in wages explained by differences in workers' characteristics. This differential favors manufacturing over the service sectors.

We have not found comparable literature on low-income and middle-income developing economies. But our reasoned conjecture is that the same argument applies to labor intensive manufacturing jobs in low-income sectors. Generally speaking there is a large inflow of workers into manufacturing, whenever manufacturing jobs become available. Also if wages reflect productivity differentials, higher productivity in manufacturing – see section 3.1.3 – allows for higher labor earnings. From this perspective the creation of manufacturing jobs makes a direct contribution to poverty reduction.

In spite of the qualities, which make manufacturing jobs more desirable than jobs in other less productive sectors of the economy, the scope to which manufacturing can directly absorb workers is ultimately limited. Table 2 provides information about employment in manufacturing, both in absolute numbers and in shares of total employment in a sample of developing and advanced economies, since 1975.

Table 2. *Direct employment in manufacturing across the world. Number of workers and share on total employment (1975-2005). Selected countries and years*

	Manufacturing workers (in thousands)				Manufacturing share in total employment			
	1975	1985	1995	2005	1975	1985	1995	2005
All Sample	**-**	**-**	**250,597**	**274,128**	**20%**	**19%**	**17%**	**15%**
Advanced Economies	**-**	**61,413**	**56,309**	**49,163**	**26%**	**23%**	**19%**	**15%**
Australia[2]	1,381	1,129	1,112	1,054	23%	16%	13%	11%
France[1]	5,462	4,714	3,815	3,538	26%	21%	17%	14%
Germany[2]	10,433	9,768	8,441	7,515	32%	29%	22%	19%
Italy[1]	5,659	5,818	5,169	5,072	28%	27%	23%	21%
Japan[2]	13,807	14,390	13,830	10,979	25%	24%	21%	17%
Netherlands[1]	1,241	1,035	1,067	975	23%	19%	15%	12%
United Kingdom[1]	7,620	5,372	4,212	3,632	29%	22%	17%	13%
United States[1]	20,408	19,187	18,663	16,399	22%	18%	14%	11%
Latin America	**-**	**17,051**	**19,318**	**21,205**	**17%**	**16%**	**15%**	**12%**
Argentina[1]	1,932	2,094	1,907	1,635	21%	18%	15%	12%
Brazil[1]	5,345	7,852	8,292	9,619	14%	15%	14%	13%
Chile[1]	616	507	810	723	21%	14%	16%	11%
Colombia[1]	716	1,024	1,678	1,774	10%	11%	13%	11%
Mexico[1]	3,081	4,742	5,618	6,622	19%	19%	18%	17%
Venezuela[1]	584	832	1,014	832	14%	17%	14%	10%
Africa	**-**	**-**	**4,924**	**7,230**	**-**	**-**	**8%**	**9%**
Ethiopia[3]	-	-	577	1,529	-	-	2%	5%
Ghana[3]	-	-	613	1,013	-	-	9%	12%
Kenya[3]	-	-	822	1,686	-	-	8%	11%
Nigeria[3]	-	1,292	1,004	908	-	4%	3%	2%
Senegal[3]	-	-	360	388	-	-	12%	9%
South Africa[5]	-	1,605	1,548	1,706	-	15%	15%	14%
Asia	**-**	**137,589**	**170,045**	**196,529**	**18%**	**19%**	**18%**	**16%**
China[4]	-	93,275	102,486	120,409	-	16%	15%	16%
Hong Kong[1]	742	919	535	228	45%	36%	18%	7%
Indonesia[1]	3,695	6,025	11,505	12,406	8%	10%	14%	14%
India[1]	18,646	26,160	38,965	45,134	9%	10%	11%	12%
Malaysia[1]	448	855	2,052	2,271	11%	15%	26%	23%
Philippines[1]	1,656	1,927	2,578	3,049	11%	10%	10%	9%
Singapore[1]	219	313	385	485	26%	25%	23%	21%
South Korea[1]	2,205	3,504	4,797	4,234	19%	24%	24%	19%
Thailand[1]	1,317	2,109	4,293	5,588	8%	9%	14%	16%
Taiwan[1]	1,518	2,502	2,449	2,726	27%	34%	27%	27%

Sources: *(1) Timmer and de Vries (2008) ; (2) EU-KLEMS Database (http://www.euklems.net/); (3) McMillan and Rodrik (2011); (4) de Vries et. al. (2012); (5) Naudé et. al. (2012)*

Note*: Data on China refers to the year 1987 instead of 1985.*

Three important features stand out in table 2. First, the direct labor absorption capacity of the manufacturing sector is ultimately limited. In 2005 there were only four countries in our sample (Singapore, Malaysia, Italy and Taiwan), where the sector represented more than twenty per cent of total employment. In most countries and most years, the share lies somewhere between 10% and 20% of total employment. The second feature is the clear downward trend in the share of manufacturing in total employment over time. In three of the four country groups, the average share has fallen during the last three decades. This decline is most notable in the advanced economies (with a decline from 26% to 15% on average), but it also occurs in the less developed countries of the sample (Especially in Latin America and in some African countries). The third feature is that in developing countries, the actual number of manufacturing jobs is usually increasing . However, the rate of employment growth tends to be lower than in other sectors of the economy, resulting in stable or even declining employment shares. The secondary literature has mainly focused on the first two features, with less attention to increases in absolute employment numbers.

Early studies of the employment problems of developing countries stressed the issue of sectoral employment shares long ago. Galenson (1963), for example, analyzed the evolution of sectoral employment in several countries between 1952 and 1962 and concluded that "*it is not in the manufacturing sector of newly developing countries, but in the tertiary sector, that the bulk of the new employment is likely to be located*" (*ibid* p. 518). In a similar vein, (Baer and Herve, 1966) highlighted the disillusionment of many industrialization advocates in the first half of the 1960s due to the fact that manufacturing was not absorbing labor at a sufficiently rapid rate to cope with increases in the (urban) population and the labor force. Tyler (1976) analyzed the prospects of less developed countries for attaining substantial relief from their unemployment and surplus labor problems through the expansion of manufactured exports, and concluded that "*only in the case of relatively small economies can industrial export expansion become a driving force in providing employment sufficient to alleviate their problems of labor resource underutilization*" (*ibid* p. 369). (Well-known examples of successful labor absorption include South Korea and Taiwan and presently Vietnam).

Nevertheless, all these authors were convinced that manufacturing played a key role in employment creation, though not primarily through the direct absorption of workers. Its main contribution, as we will see in section 4.2, lies in the stimulus given to the creation of employment in other parts of the economy.

The declining share of manufacturing in employment over time, has extensively been discussed and analyzed in the literature on deindustrialization.[18] On the basis of the experiences of the most advanced economies since the 1970s, many authors defined deindustrialization as the secular decline in the share of manufacturing employment in total employment[19]. According to these authors, the secular decline in manufacturing's employment share would be the consequence of the faster productivity growth of manufacturing compared to services. As Rowthorn and Ramaswamy (1997) clearly explain, "*if there is a long-term tendency for real*

[18] See Tregenna (2013) for an overview of this literature.

[19] See for example, Baumol et al.(1989); Rowthorn and Ramaswamy (1997); Rowthorn and Wells (1987) and Singh (1977).

output of services to grow faster than manufactured goods, but productivity in manufacturing increases consistently faster than in services, then the pattern of employment will shift away from manufacturing into services. The service sector will have to absorb an ever greater proportion of total employment just to keep its output rising in line with that of manufacturing" (*ibid* p. 12). From this point of view, deindustrialization would not represent a symptom of failure but the natural outcome of successful economic development.

Recent contributions, however, have challenged this optimistic view, and have pointed out that similar processes of deindustrialization can be observed in countries that have not yet achieved such high levels of per capita income, raising the specter of "premature" deindustrialization (Dasgupta and Singh, 2006; Palma, 2005; Tregenna, 2008, 2013). Premature deindustrialization has taken place in most Latin American economies and many African countries (as shown in Table 1). Such economies are "*particularly at risk of losing out the growth pulling effect of manufacturing*" (Tregenna, 2008, p. 459) and thus, damaging their long-term growth perspectives, "*not just for the speed of their economic growth but (crucially) for its sustainability*" (Palma, 2005, p. 47).

Very much in line with these conclusions, McMillan and Rodrik (2011) show that since 1990 structural change has been growth-reducing in both Africa and Latin America, which can be partly explained by the "process of rationalization of manufacturing industries". According to the authors, when the less productive firms exit the industry, the question left unanswered is what happens with the workers displaced. If (as seems to be the case in Latin America) they end up in less productive activities (mainly services, or the informal sector), then the overall productivity of the economy will be reduced.

In the discussion of de-industrialization, Tregenna (2013) decomposes changes in manufacturing employment into two components: changes in value added and changes in labor productivity. De-industrialization is a major problem when a decline in manufacturing employment is caused by the shrinking of manufacturing value added. The term pre-mature de-industrialization should be reserved for this phenomenon. If manufacturing output continues to grow, but employment shares shrink due to increasing productivity this is less of a problem as the economy is clearly dynamic and manufacturing is playing a positive role. Tregenna concludes that there are indeed many developing countries suffering from premature de-industrialization. The conclusion she derives from this analysis is that when de-industrialization is premature, policy makers should give very high priority to re-industrialization.

4.2. INDIRECT AND INDUCED EFFECTS

As we noted earlier, the idea that the impact of manufacturing on employment creation goes far beyond the workers directly absorbed by the sector, has been around for a long time. In 1963, Galenson already called the attention to the fact that the role of manufacturing "*is not likely to be that of major source of new employment. Rather, it will tend to generate the effective demand leading to employment expansion in other sectors*" (Galenson, 1963, p. 507). In a similar vein, Baer and Herve (1966) stressed that if manufacturing "*requires a substantial*

service sector in order to function, such a requirement would eventually provide a major source for coping with the employment problem" (*ibid* p. 104).

A pioneer attempt to quantify such indirect effects can be found in Park and Chan (1989). These authors examine the intersectoral relationships between manufacturing and services at different stages of industrialization. In their view, the nature of the service sector changes according to the phase of industrialization. At the early phases, various types of small-scale services in the informal sector dominate the service activity. As the economy progress along the path of industrialization, the importance of informal activities diminishes while service employment is stimulated by inter-industry demand for service inputs and income-induced final demand for personal and social services. Thus, for very different reasons, the employment share of service sector tends to dominate in both ends of the industrialization trajectory. Therefore, "*the capability of the service sector to generate and sustain high levels of employment critically hinges upon its vital linkages with manufacturing*" (*ibid* p. 201).

To test this relationship, the authors undertake a cross-country comparative analysis of input-output tables of 26 countries between 1968 and 1975. They examine two main variables: the dependency ratios between sectors (defined as the share of inputs of one sector in the total input expenditures of the other sector) and the sectoral input-output multipliers (column sum of the Leontief inverse matrix). In the case of services, they distinguish four groups: producer services (*finance, professional services, cleaning, maintenance* and *security*), distributive services (*transport, communication, wholesale* and *retail trade*); personnel services (*domestic services, hotels, restaurants, repairs, entertainment* and *recreation*); and social services (*public administration, health* and *education*). Their main hypothesis is that while manufacturing develops a direct symbiotic relationship with producer and distributive services, it only affects personnel and social services by its indirect income induced effects (Keynesian multiplier effects).

They find that service activities tend to depend much more on the manufacturing sector as source of inputs than *vice versa*. Moreover, according to their estimates, the manufacturing sector tends to generate a two- to threefold greater output impact on the economy than any service subsector per dollar delivery of final demand. These findings lead the authors to conclude that "*employment generation in the service sector is of a passive nature and responds only to stimulus provided by other sector of the economy, particularly the manufacturing industries*" (p. 209).

This conclusion, however, has been criticized. Lewis (1991) points out that the aforementioned paper focus on output instead of employment and do not incorporate income-induced effects in its estimates. According to this author, the use of output multipliers to evaluate employment generation is dubious, because it would only yield accurate results if the employment-output ratios are the same across sectors, which is unlikely to be the case. In addition, multipliers based on input-output tables do not take into account the impact of household expenditures on overall output (the income-induced effects). To overcome both limitations, Lewis proposes the use of employment or wage multipliers derived from Social Accounting Matrices (SAMs). Models based on SAMs have the advantage of endogenizing factors of production and household income and expenditure, thus incorporating income-induced effects. To empirically exemplify this

point, he presents employment multipliers based on SAMs for four countries (Kenya, Indonesia, South Korea and United States) and shows that, in general, the multipliers for manufacturing are smaller than the multipliers for the service sectors.

Engelbrecht (1992) also emphasizes the importance of income-induced effects when evaluating the comparative performance of manufacturing and services in terms of employment creation. Using a modified version of Japan's 1980 Input-Output Table (that only accounts for all goods and services associated with the creation, storage and dissemination of information), he finds that although service's sector output multipliers are often smaller than those of manufacturing, they are very close in value when consumption induced effects are taken into account.

After this early debate, techniques based on extended input-output models and SAMs have been extensively used to estimate the direct and indirect impact of certain sectors or industries in overall employment at the national and regional level, in different countries and points of time. In particular, two main indicators have been used to capture these effects: the "normal employment multiplier" (NEM)[20] and the "ratio employment multiplier" (REM)[21]. While the NEM captures the total impact on employment derived from an increase of one unit of final demand in the sector under analysis, the REM captures the number of indirect jobs generated by one extra job in that sector. Formally,

$$NEM_j = \sum_{i=1}^{n} \lambda_i a_{ij} \tag{4.1}$$

where, a_{ij} is the ijth element of the Leontief inverse matrix, and λ_i represents the direct requirement of labor per unit of output in each sector i. To better understand this expression, let us assume an increase of one unit in the final demand of goods produced by sector j. To produce this extra unit, sector j will need inputs from all its supplying sectors, which in turn will need inputs from their own suppliers, and so on, in the typical input-output multiplier mechanism. These effects are captured in a_{ij} for each sector ($i= 1 \ldots n$) of the economy. In order to produce the additional output, each sector will need extra labor. Assuming constant technology and returns to scale, the extra labor needed in each sector will be given by $\lambda_i a_{ij}$. Summing up all the extra labor required (directly and indirectly) to produce an extra unit of final good in sector j, we get the overall employment effect, as expressed in equation (4.1).

The relative employment multiplier can be easily computed dividing the NEM by the direct employment created in sector j, namely λ_j, as follows:

$$REM_j = \frac{NEM_j}{\lambda_j} = \sum_{i=1}^{n} \lambda_i a_{ij} \Big/ \lambda_j \tag{4.2}$$

[20] Also called "final demand multiplier" (BEA, 1997) or "absolute multiplier" (Cruyce & Wera, 2007).

[21] Also called "direct-effect multiplier" (BEA, 1997) or "relative multiplier" (Cruyce & Wera, 2007).

In this case, the result will express the number of employment created in the whole economy per employment created in sector *j*, due to an increase of one unit in the final demand of goods produced by sector *j*.

An important advantage of the *REM* is that it is unit-free, and thus enables meaningful time series or cross-country comparisons when Input-Output tables are expressed in current prices and/or countries have different currencies (Cruyce and Wera, 2007). As we will see, however, the conclusions may change dramatically according to which multiplier is used.

Using these techniques, Baker and Lee (1993) analyze the impact of manufacturing on overall employment for the US economy in 1992 and find that the average manufacturing job generates two to three times as many indirect jobs as service sector. Their estimates are based on a modified version of the *REM*, in which the indirect effect on employment is extended to capture indirect jobs created by capital services (new investments undertaken to replace capital depleted during the production process) and induced jobs created by re-expenditures of workers' pay checks and tax collection (government employment).

Following the same methodology Bivens (2003) updates the employment multipliers for the year 2002, and compare the estimates across four major sectors: *Manufacturing*, *Health services*, *Retail Trade* and *Personal/Business services*. He finds that the *REM* in manufacturing is much larger than in any of the other sectors. Two reasons are given to explain this difference: manufacturing production tends to have larger intermediate and capital services requirements (and thus, higher indirect effects) and tends to pay relative higher wages, that in turn, lead to larger re-spending and government employment (income induced effects).

An important remark made by Bivens is that the multiplier effect should focus on the impact of an extra job in manufacturing rather than the impact of an extra dollar (that is, in the *REM* instead of the *NEM*). In his view, looking just at the employment requirements tables provided by usual Input-Output or *SAM* models might be misleading because "*... one can get the mistaken impression that final demand or sales directed towards the manufacturing sector is an inefficient way to create jobs, as any given amount of final sales in manufacturing generates fewer jobs than an equivalent amount spent in other sectors. Using jobs instead of sales as the relevant denominator, however, it can be seen that employment in manufacturing supports much more secondary employment than in other sectors.*" (*ibid*., p. 22). The reason for this would be that manufacturing typically pays higher wages and requires a larger number of material and equipment purchases. Therefore, each manufacturing job is more costly than jobs in other sectors but will generate more total employment.

A similar outcome is found by Cruyce and Wera (2007) for Belgium. Based on the 2000 Belgian input-output tables, the authors construct qualitative employment multipliers (that is, multipliers that differentiate workers by gender, age class, professional status and educational attainment level) and find that manufacturing *REM*s are well above the economy average and are the second highest after *Construction*. When they compute the *NEM*s, however, the results are different. In this case, the multiplier for manufacturing almost equals the economy's average and is much lower than the multipliers for most service sectors. According to the authors, the difference between REM and NEM indicates that the sectors which provide manufactured goods

for final demand rely on a chain of suppliers that are themselves much more labor intensive. With regard to the low value of NEM for manufacturing, this is partly explained by the lower shares of part-time workers in the manufacturing sector (13% against 22% average of the economy), since employment is expressed in the number of persons, and not in full-time equivalent workers.[22]

On balance, the evidence emphasizes the importance of indirect employment creation in manufacturing. Recent international comparisons of employment multipliers based on Input-Output techniques also seem to confirm the preeminent role of manufacturing (or certain industries) as indirect creator of jobs.

Valadkhani (2005) compares the *REM*s of three OECD countries (Australia, Japan and the US) based on Input-Output tables at three points in time (1980, 1990 and 1997) and finds that the highest employment generating sectors are found within manufacturing. From a list of 17 sectors, in all three countries, the largest employment multipliers are in *Food, Beverage and Tobacco*; *Chemicals, Petroleum, Coal, Rubber & Non- Metallic Minerals*; and *Basic Metals/Fabricated Products*. This result does not change through time or across countries.

Using a similar approach, but for a much larger sample of countries, Stehrer and Ward (2012) find similar results. Based on the recently released data of the World Input-Output Database (WIOD) that covers 40 countries for the period 1995-2006, the authors estimate Input-Output based *REM*s for 12 sectors, and find that employment multipliers are typically highest in some manufacturing industries (such as *Chemicals* and *Transport Equipment*) and tend to be lower in service activities.

A counter example is provided by Tregenna (2007) who analyzes input-output and SAM based *NEM*s for South Africa for the period 1980-2005, and finds that the multipliers are systematically higher for services than for manufacturing. When jobs generated are distinguished according to their skills (high-skilled, skilled and unskilled employment), the same results hold except for the unskilled jobs. For unskilled jobs, the multipliers for manufacturing are always higher than the ones for services. An important remark here is that this author makes use of *NEM*s (instead of *REM*s), which according to the literature previously reviewed, always seem to yield lower values for manufacturing. In a related work, however, the same author emphasizes that much of the high growth in service employment in South Africa during the period 1997-2007, is explained by an outsourcing-type reallocation of labor intensive activities (such as cleaning and security) from manufacturing (Tregenna, 2010).

In the following table, we list the sectoral *REM*s estimated by the various authors reviewed throughout the section for different countries and years, highlighting (in bold) the three activities with highest multipliers.

[22] In case of less part-time employment, one will have less persons employed per unit of final demand.

Table 3. *Relative Employment Multipliers (REMs) for different countries and years*

	USA	**Australia**	**Japan**	**USA**	**Belgium**	**EU-27**	**Japan**	**USA**
	2003	**1997**	**1997**	**1997**	**2000**	**2005**	**2005**	**2005**
	Bivens (2003)	*Valadkhani (2005)*			*Cruyce and Vera (2007)*	*Steher and Ward (2012)*		
Agriculture, forestry & fishing		1.5	1.6	2.1	1.4			
Mining & quarrying	2.0							
Manufacturing	**2.9**				**2.1**			
Food, beverages & tobacco		***3.8***	*2.1*	***3.7***				
Textiles		*1.7*	*1.6*	*1.9*		*1.5*	*1.5*	*1.8*
Wood & paper products, furniture		*2.2*	*1.8*	*1.9*				
Chemicals and non-metallic minerals		***2.5***	***2.4***	***2.8***				
Chemicals						***2.3***	***5.0***	***4.0***
Non metallic minerals						***1.8***	*2.0*	*1.9*
Basic metals/Fabricated products		***2.3***	***2.3***	*2.3*		*1.7*	***3.0***	*2.2*
Machinery & equipment		*1.9*	***2.3***	*2.4*				
Electrical equipment						*1.8*	*2.4*	***2.2***
Machinery & equipment						*1.6*	*2.4*	*2.2*
Transport equipment						***2.0***	***3.9***	***3.2***
Other manufacturing nec.		*1.5*	*1.3*	*1.8*				
Electricity, gas & water	**6.2**	2.3	2.2	**2.6**	**1.9**			
Construction	1.9	1.6	1.5	1.9	**2.1**	1.7	1.7	1.6
Wholesale trade	1.6	1.4	1.3	1.3	1.6	1.6	1.7	1.5
Transport, storage & communication					1.8			
Transport & storage	*1.7*	*1.9*	*1.3*	*1.7*				
Communication services	*2.5*	*1.7*	*1.5*	*1.8*				
Financial, real estate & business					1.8			
Financial activities	***2.4***	*1.5*	*1.3*	*1.8*		*1.8*	*2.0*	*2.1*
Business services	*1.6*	*1.8*	*1.8*	*1.5*		*1.5*	*1.5*	*1.5*
Community, social & personal services	1.1	1.2	1.2	1.2				
Public adm., defense education					*1.1*			
Health & other services					*1.2*			

***Source**: Own elaboration based on Bivens (2003), Table 8, p. 23; Valadkhani (2005), Table 1, p.867; Cruyce and Vera (2007), Table 2, p.18; and Steher and Ward (2012), Table 4.3.1, p.173.*

***Note**: REM is defined as the average number of jobs created in the whole economy as a result of the creation of one job in a given sector. The multipliers are not strictly comparable among each other. See Section 4.2 for details on the effects considered by each author.*

As we can see from the table, manufacturing (or certain industries within manufacturing) always ranks among the three sectors with highest *REM*. The evidence reviewed, therefore, seems to confirm the important role played by manufacturing industries in the creation of employment, particularly via the indirect channels previously detailed.

Micro-level approaches

Shifting from macro-level approaches to micro-level approaches, studies at the micro level also highlight the important role played by manufacturing firms in the creation of employment and reduction of poverty in the areas in which they operate.

Abdo (2011a) studies the direct and indirect employment impacts of a series of investment projects which have expanded the production capacity of a multinational firm that produces structural metal products and operates in several African countries. Based on interviews and financial data he finds that this expansion had a significant positive impact on employment creation, yielding a multiplier effect of 5.1 indirect jobs per every direct job created (i.e. a REM of 6.1). Most of these indirect effects are explained by employment created in sales and distribution rather than employment created in the firms supplying input. This is due to the capital-intensive nature of the industry and the fact that most raw materials are imported from global supply chains.

Using a similar approach Kumar and Iverson (2011a) analyze the impact on job creation of two investment projects that financed the expansion of production capacity in an Indian cement firm. Their estimates show that this investment created about 300 direct jobs and 7.200 indirect jobs, resulting in a multiplier effect of 25 indirect jobs per every direct job created. The largest employment effects are again found in the distribution network.

Kumar and Iverson (2011b) study the impact on job creation of two investment projects that financed the expansion of an agro-processing firm in Bangladesh. They also find very important positive multiplier effects: the expansion resulted in about 300 new direct jobs and 2.200 new indirect jobs, implying that eight new indirect jobs were created for every direct job.

Another study worth mentioning is Abdo (2011b). In this paper, the author analyzes the job creation effects of an investment project in an Indonesian oleochemicals firm. He finds that the expansion of production capacity created about 177 direct jobs and 3600 indirect jobs. This yields a multiplier of 21 indirect jobs per direct job.

A common feature highlighted by all these studies is that the multipliers should be interpreted with some caution, because they highly depend upon regional and industry contexts and the supply channel models used by each firm. Nevertheless, they clearly show the important indirect effects that manufacturing investments have on the creation of indirect employment in the areas where they operate. This type of studies, therefore, provides further evidence about the important role of manufacturing creating both direct (and most importantly) indirect jobs.

An interesting question is why the multipliers obtained in micro-studies tend to be so much higher than the sectoral multipliers presented in Table 3. The reasons for this are twofold. First, micro-studies tend to disregard cross-sectoral effects, which are captured better in macro-studies. They are partial equilibrium approaches. Approaches based on input-output or SAM techniques at the regional or national level base their multipliers on final demand expenditures, which are assumed to be exogenous to the system. In this way, the possibility of duplications is ruled out because the production of inputs (and associated jobs) coming from upstream sectors is imputed to the downstream sectors which are actually serving final demand. In this context,

the sectoral aggregation of all direct, indirect and induced effects on employment will always add up to the total number of workers (or jobs) of the country or region under analysis. These cross-sectoral effects are extremely difficult (if not impossible) to estimate from a micro perspective, and thus the multipliers tend to much larger due to duplication effects[23].

Second, the micro studies refer to specific firms operating in specific branches of manufacturing. Not all manufacturing sectors and activities have the same impacts in terms of employment creation. Some sectors are much more labor intensive than others. Some sectors have more linkages than others. Within each sector, some firms create much more employment than others. The aggregate numbers as presented in Table 3, result from averaging these differences into a single sectoral estimate, and are therefore likely to give lower multipliers.

From an investment perspective, the macro and micro approaches provide different lessons. Macro studies show that the *REMs* for manufacturing are usually higher than for other sectors. From an employment creation perspective, this is an argument for investing in manufacturing. But a macro-study cannot provide indications of which firms or specific activities to invest in. Here the micro-approach is of special value. It helps us identify the specific firms, projects or activities which have very high employment multipliers.

In the light of the macro and micro evidence on employment multipliers presented in this section, the phenomenon of premature deindustrialization acquires renewed urgency. So far we have interpreted the multipliers from a positive perspective: how many jobs are created if a new job is added in manufacturing. From, an opposite perspective the question can be rephrased as follows: how many jobs are destroyed if one job is destroyed in manufacturing. Given the high employment multipliers that characterize the manufacturing sector, the negative effect of deindustrialization on total employment might be much more serious than expected. Reversing premature industrialization becomes an important policy challenge.

4.3. SUMMARY OF FINDINGS ON EMPLOYMENT CREATION

The findings with regard to employment creation can be summarized as follows

- One should distinguish between the direct creation of jobs in manufacturing and the jobs indirectly created in other sectors
- In advanced economies manufacturing employment is shrinking in absolute terms.
- In most developing countries manufacturing employment is still increasing, but there are important differences between countries. Employment creation is most marked in Asian economies. In China and to a lesser extent India there are huge increases in the numbers of persons employed in manufacturing.

[23] An example can easily illustrate this point. An impact analysis of certain firm that produces steel would normally include all the workers of this firm (direct employment effect) as part of the total impact that this firm has on employment creation (or the total employment multiplier). From a general equilibrium perspective, however, part of these jobs should in fact be imputed to the automobile industry which buys steel to produce cars. This kind of adjustments, however, is very difficult to incorporate in micro studies.

- Manufacturing jobs tend to be high quality jobs with higher wages and more indirect benefits.
- Even in those countries where manufacturing employment is increasing in absolute terms, the shares of manufacturing in total employment are either stable or declining. Only in one or two exceptional cases has the share of manufacturing increased since 1995.
- In 2005 there were only four countries in our sample (Singapore, Malaysia, Italy and Taiwan), where the manufacturing sector accounted for more than twenty per cent of total employment. In most countries and most years, the share of manufacturing lies somewhere between 10% and 20% of total employment.
- The low shares of manufacturing in employment lead to the conclusion that while manufacturing can contribute to employment creation, this sector cannot absorb the supply of labor in developing countries. There is a limit to the role of direct employment creation in manufacturing. Other sectors will have to take up the slack.
- The indirect effects of manufacturing are much more important, than the direct effects. On balance, the literature reviewed suggests that manufacturing tends to create substantial numbers of jobs in other sectors of the economy, through a variety of linkages. Employment multipliers are usually higher than those of other sectors. For every job created in manufacturing, the evidence suggests that in total two to three jobs are created.
- In micro-level studies, very high employment multipliers are found for expansion of manufacturing production capacity. Multipliers range from five to more than twenty indirect jobs for every job created in manufacturing.
- For the decision on which sectors to investment in – from the perspective of employment creation – macro studies are a good guide. Macro studies average out differences between firms and take general equilibrium effects into account.
- On the other hand micro studies are of special importance for the decision in which specific activities one should invest.
- The combined direct and indirect employment effects of manufacturing provide arguments for investment in manufacturing from an employment perspective.
- Premature de-industrialization is a threat to employment, in particular through the indirect employment multipliers. For every job destroyed in manufacturing, more jobs will be destroyed in other sectors. In countries facing premature de-industrialization, the policy challenge is to make a switch towards re-industrialization.

5. MANUFACTURING AND POVERTY ALLEVIATION

In this chapter we discuss the role of manufacturing in poverty alleviation. Poverty can be defined in terms of the *headcount* (the number of people in a country below a given poverty line) or the *poverty gap* (the amount of money needed to bring persons below the poverty line up to the level of the poverty line) (Sen, 1981). Poverty alleviation can be defined as a decline of the headcount or a reduction of the poverty gap.

What the appropriate poverty line is, is subject to debate (Chen and Ravallion, 2008), but this is less important if one is interested in trends.

As explained in chapter 2, the link between growth of manufacturing and poverty reduction runs via the direct and indirect creation of jobs, of which the earnings are higher than the earnings the workers enjoyed either in their previous occupations or as non-employed persons. In chapter 2, we made a distinction between *direct effects* on poverty through the creation of more jobs or higher incomes in the manufacturing sector, the *indirect effects* via employment multipliers due to a variety of linkages between manufacturing and other sectors and the *induced effects* of growth of manufacturing on aggregate growth via technology spillovers and induced demand. This framework was applied in chapter 4 on employment creation and will now be used to analyze the poverty impacts.

The existing literature on this topic is still very inconclusive, partly because the channels for poverty reduction are so complex that it is hard to reach firm conclusions. Poverty is influenced by productivity developments, growth of employment, composition of employment, investment in human capital, social protection policies, institutionalized inequality, health facilities, political stability and many other factors. Also conditions differ very much between countries and regions. Large numbers of the poor are found in the least developed countries (LDCs). But widespread poverty also persists in countries with much higher average per capita incomes such as India, Brazil or South Africa with unequal distributions of income. Finally, while there is a large literature on the growth elasticity of poverty at the aggregate level (e.g. Bourguignon, 2003, Dollar and Kraay, 2002, Ravallion 2001), less is known about the impacts of sectoral growth on poverty. Much more research remains to be done on this topic.

In chapter 2, we discussed the relationships between manufacturing and economic growth and concluded that manufacturing continues to be one of the important engines of growth in low-income and middle-income countries. The poverty elasticity of aggregate growth of GDP per capita is generally found to be positive (e.g. Dollar and Kraay, 2002). Therefore, a powerful implicit conclusion is that the indirect and induced effects of a dynamic and successful manufacturing sector are also positive. The historical evidence of the declines of poverty in the export-oriented Asian economies strongly supports this view (e.g. China, Indonesia, India, Vietnam, Malaysia, Taiwan, South Korea). In chapter 3, we discussed the positive role of direct and indirect employment creation in manufacturing. As manufacturing jobs tend to be more productive and better paid than jobs in many other sectors, the – again implicit – conclusion is that manufacturing growth will make a positive contribution to poverty reduction.

The discussion of the secondary literature in this chapter is structured as follows. In section 5.2 we discuss the poverty elasticity of sectoral growth. This section focuses mainly on the direct effects of different sectors of the economy on poverty levels through the creation of jobs or increases in incomes. In section 5.3 we focus on the indirect and induced effects of sectoral growth on poverty, through its short-run impact on growth and employment creation in the economy at large. In section 5.4 we zoom in on the role of manufacturing in terms of structural transformation of the economy. In this section we also revisit the discussion of the engines of growth and the implications thereof for poverty reduction.

As we will see, most of the literature on the topic is rather static in nature and has focused mainly on the direct channel (increases in incomes of the poor), neglecting the important dynamic effects through which manufacturing (and more generally, structural change) would reduce poverty.

5.1. SECTORAL POVERTY ELASTICITY OF GROWTH

Although it has been widely recognized that the composition of growth matters for poverty alleviation, the empirical evidence on the subject is still quite limited. The literature has focused on estimating and comparing the poverty-elasticity of growth (*PEG*)[24] for different sectors in order to identify the most *pro-poor* patterns of growth. This literature focuses primarily on the direct contribution of economic sectors to poverty reduction.

An early attempt along these lines can be found in Ravallion and Datt (1996). Combining data on poverty (from national household surveys) and net domestic product at constant prices (from the national accounts statistics) for India between 1951 and 1991, these authors split the economy into primary activities (agriculture and mining), secondary activities (manufacturing, construction and utilities) and tertiary activities (services), and evaluate the impact of the output composition of growth on poverty reduction. To do so, they estimate the following equation:

$$\Delta \ln P = \pi_1 s_1 \Delta \ln Y_1 + \pi_2 s_2 \Delta \ln Y_2 + \pi_3 s_3 \Delta \ln Y_3 + \varepsilon_Y \qquad (3.1)$$

where, P is the average level of poverty, π_i are parameters to be estimated, s_i are the shares of each sector on total income, Y_i are the outputs of each sector, Δ is the discrete time difference and ε_Y is an error term. The coefficients π_i can be interpreted as the impact of the (share-weighted) growth of sector *i* in average poverty P. Thus, the sectoral *PEGs* are obtained by multiplying these regression coefficients by the relevant income shares.

The authors estimate equation (3.1) using three different measures of poverty (headcount index, poverty gap index and squared poverty gap index) and find that for all measures, growth in both primary and tertiary sectors is poverty reducing while growth in the secondary sector has no significant effect on poverty. They conclude: "*Fostering the conditions for growth in the rural*

[24] This elasticity shows the percent fall in the poverty rates as income (or GDP, or sectoral output) increases by one percent. For a review of recent literature on the topic, see Ram (2006).

economy -in both primary and tertiary sector- must thus be considered central to an effective strategy for poverty reduction in India" (*ibid*., p. 19).

In a later paper, Ravallion and Chen (2007) apply the same methodology to study the case of China between 1980 and 2001 and find that the primary sector has a far higher impact than either the secondary or tertiary sector. The impacts of the secondary and the tertiary sector do not differ much. The null hypothesis that there is no difference in their impact cannot be rejected.

In the same vein, Suryahadi et al. (2009) estimate sectoral PEGs for Indonesia between 1984 and 2002. Their approach, however, refines the model expressed in equation (3.1) by subdividing each of the three sectors into their location (urban and rural areas). Therefore, they estimate *PEGs* for 6 subsectors: *urban agriculture*, *urban industry*, *urban services*, *rural agriculture*, *rural industry* and *rural services*. They find that growth in the urban service sector has the highest impact on reducing rural poverty (where most of the poor in Indonesia are located), followed by growth in rural agriculture. In contrast, industrial growth would have a relatively small impact on reducing poverty in both rural and urban areas.

Using a similar approach, but in a cross-country framework, Christiaensen and Demery (2007) estimate sectoral *PEGs* for 82 countries between 1980 and 2000. A distinguishing feature of their estimation strategy is that they take the distance between the poverty line and the mean income of each country into consideration. In their view, the *PEG* critically depends on this distance. Therefore, they augment equation (3.3) with interaction terms between the sectoral GDP growth term and the ratio of the poverty line to the average household income. These interaction terms increase the explained variation of the regressions. In addition, they also run the regression distinguishing countries with different levels of development in each region.

They find that on average growth generated in agriculture contributes more to poverty reduction than growth generated in industry or services, irrespective of the poverty measure used. However, they point out that this *advantage* of agriculture is likely to decrease as countries become richer. While in the poorest countries of their sample, the *PEGs* for agriculture are clearly higher than those of manufacturing, in the richer countries this difference becomes less marked and in some regions (East Asia and Latin America) manufacturing *PEGs* are even higher than of agriculture.

In contrast to most of the previous papers, Hasan and Quibria (2004) challenge the "agricultural fundamentalism" which advocates that agriculture should always be accorded the highest priority for reducing poverty. In their view, the elasticity results are very context specific, and thus, should not be generalized. Based on a dataset of 45 countries belonging to four developing regions (East Asia, South Asia, Latin America and Sub-Saharan Africa) between 1960 and 1998, they estimate the following equation using fixed effects regression techniques:

$$\ln P_{it} = \alpha + \beta_A \ln y_{it}^A + \beta_I \ln y_{it}^I + \beta_S \ln y_{it}^S + u_i + \varepsilon_{it} \qquad (3.2)$$

where, P_{it} denotes the poverty index in country i at time t, α and β are parameters to be estimated, y_{it}^{A}, y_{it}^{I}, y_{it}^{S} denote output per capita in the agricultural, industrial and service sector respectively, u_i captures country-specific time-invariant errors and ε_{it} captures the residual. It is important to notice that in equation (3.2) the βs can be directly interpreted as the sectoral *PEGs*.

They find that industrial growth has a strong and beneficial impact on poverty reduction in East Asia, but has no statistically significant impact in the other regions. According to their estimates, the key drivers of poverty reduction in South Asia and Sub-Saharan Africa appear to be agricultural growth, while in Latin America the strongest and most beneficial impact is associated with growth in services.

According to Hasan and Quibria, these results should not be interpreted to mean that all regions rather than East Asia should promote agriculture to reduce poverty. Instead, they argue that "*...these countries –especially labor abundant ones such as those of South Asia– should attempt to improve their policy and institutional environments that stand in the way of their exploiting their comparative advantage in labor-intensive industries and bringing about a rapid reduction in poverty*" (Hasan and Quibria, 2004, p. 261)

Similar conclusions are reached by Gutierrez et al. (2007), who go beyond the sectoral pattern of growth and analyze the role of sectoral productivity and employment intensity in poverty alleviation. Using a decomposition methodology, they distinguish between employment-intensive and productivity-intensive growth by sector and study their impacts on poverty, in a sample of 39 developing countries between 1980 and 2004. Their results show that employment-intensive (i.e. labor intensive) growth in the industrial sector alleviates poverty while employment-intensive growth in agriculture tends to be correlated with increases in poverty. Productivity-intensive growth in agriculture, by contrast, has a significant correlation with poverty reduction. This actually reflects the positive impact of moving redundant workers out of agriculture. They conclude that "*higher employment will reduce poverty only if it is concentrated in the good jobs sector. On average, this appears to be the secondary sector (...) Focusing on the rising productivity of agriculture and moving workers out of the agricultural sector will also alleviate poverty*" (*ibid*., p. 33).

The role of manufacturing in poverty alleviation has also been highlighted by Habito (2009) who correlates aggregate *PEGs* and sectoral shares in GDP, for a sample of 15 Asian countries between 1990 and 2006. He finds evidence that in recent years the manufacturing sector may have played a more important role than the agricultural and service sectors as driver of employment and poverty reduction (especially in Southeast Asia).

The following table summarizes some of the main results reviewed in this section regarding the sectoral *PEGs*.

Table 4. *Poverty Elasticity of Growth (PEG) for different countries and years. Primary, secondary and tertiary activities.*

Source	Country/Region	Period	Poverty Elasticity of Growth in		
			Primary Activities	*Secondary Activities*	*Tertiary Activities*
Ravallion and Datt (1996)	*India*	*1951-91*	-0.56	not sig.	**-1.07**
Hasan and Quibria (2004)	*East Asia*	*1960-98*	not sig.	**-1.31**	not sig.
	Latin America	*1960-98*	not sig.	not sig.	-1.21
	South Asia	*1960-98*	**-1.17**	not sig.	not sig.
	Sub-Saharan Africa	*1960-98*	**-0.32**	not sig.	not sig.
Christiaensen and Demery (2007)	*Sub-Saharan Africa*	*1980-2000*	**-2.07**	-0.63	not sig.
	South Asia	*1980-2000*	**-1.94**	-0.66	not sig.
	East Asia and Pacific	*1980-2000*	**-1.42**	-1.06	not sig.
	Eastern and Central Europe	*1980-2000*	**-1.16**	-0.83	not sig.
	Latin America and Caribbean	*1980-2000*	-0.82	**-0.84**	not sig.
	Middle East and North Africa	*1980-2000*	**-1.01**	-0.82	not sig.
Gutierrez et al (2007)	*Developing Countries (Labor intensive growth)*	*1980-2004*	8.01	**-6.14**	not sig.
	Developing Countries (productivity-intensive growth)	*1980-2004*	**-7.23**	not sig.	not sig.

***Source**: Own elaboration based on Ravallion and Datt (1996), Table 3, p. 17; Hasan and Quibria (2004), Table 2, p.258; Christiaensen and Demery (2007), Table 3.4, p.28; and Gutierrez et al (2007), Table 5, p.21 and Table 6, p. 22.*

***Note**: The elasticities are not strictly comparable among each other between the different studies because the econometric models used to estimate them are not the same. The sectoral classifications also differ, with some publications referring to the primary sector, others to agriculture. See Section 5.1 for details.*

The literature summarized in table 4 seems to suggest that a growth pattern that favors agricultural activities would be, in most cases, more effective in terms of poverty reduction than a growth strategy based on the secondary sector. As we can see, the largest *PEG* coefficients across the different studies are located in the primary or agricultural activities. However, the more recent studies also document significant poverty reduction effects of growth in the secondary sector, especially in East Asia. The poverty reduction effects of the secondary sector are highest in developing countries with labor intensive growth.

However, it should be emphasized that the approach used by all these authors has important limitations in terms of capturing the various channels through which growth in a given sector

impacts on overall poverty alleviation. In particular, the estimations based on equations like (3.1) cannot capture the important cross-sectoral effects that are at the core of the growth process. If manufacturing works as an engine of growth –as argued in chapter 3–, then growth in other sectors is partly driven by manufacturing growth. Therefore, the positive impact on poverty that results from this manufacturing-induced type of economic growth should be imputed to manufacturing instead of agriculture or services. This is the logic behind the indirect and induced mechanisms detailed in chapter 2. Econometric OLS estimations, however, do not account for these effects because they partial them out[25].

For these reasons, the results presented in this section should be taken with caution and no premature conclusions should be drawn relying exclusively on sectoral *PEGs* estimated using techniques that rule out very important interactions between the different sectors of the economy. These methods focus on short-run effects. It is logical that in low-income countries with a large segment of the poor population working in the agriculture sector, improvements in agricultural growth will have the most immediate impacts on poverty. As will be argued in section 5.3, the long-run effects run in the opposite direction.

5.2. INDIRECT AND INDUCED EFFECTS

Due to the extremely complex chain of effects involved, very few contributions have tried to empirically quantify the indirect and induced impacts that the growth in a certain sector might have on poverty reduction (second and third point detailed in Section 2.1).

Thorbecke and Jung (1996) constitute a pioneering attempt along these lines. They propose a decomposition technique based on the social accounting matrix (SAM) framework to analyze the extent to which different production activities affect household groups' income and ultimately poverty alleviation, and the structural mechanisms and linkages through which an initial rise in a given sector's output contributes, directly and indirectly, to poverty alleviation.

Given the usual assumptions of SAM models, they show that the poverty alleviation effect of certain activity can be decomposed into the product of: i) *mean-income effects* (changes in average incomes received by the various groups involved directly or indirectly in the production of that sector's output); and ii) *poverty-sensitivity effects* (which, in turn, depend on the respective household group's poverty elasticity to mean-incomes and the intra-group income distributions).

The mean-income effects are further decomposed into the following effects:

i) *Distributional effects*: represent the initial effects of a change in output of the respective production activities on the incomes of the various socioeconomic groups. This impact on incomes is further decomposed into the following effects:

   (1) *Direct effect:* income received by a given household group directly from the factors provided by that group and used as primary inputs in the production of the commodity under consideration;

[25] We thank Bart Verspagen and Richard Bluhm for valuable comments and advice on this particular issue.

(2) *Indirect effect:* indirect factor incomes received by the same group from the intermediate inputs required in the production of the initial commodity;

(3) *Transfers effect:* incomes accruing to that group from transfers and remittances from other household groups.

ii) *Interdependency effect* (closed-loop effect): captures the direct and indirect effects of spending and respending by the particular household group, under consideration, and other groups that benefited, income-wise, from the exogenous output injection.

According to the authors, while the strength of the distributional effects depends mainly on the technology in use (labor intensity, for example) and the factor endowments of the households (skills and land, for example), the interdependency effect reflects the extent of integration within the economy on both demand and supply sides.

Once one has estimated the mean-income effect in each household group derived from an output increase of a certain activity, its poverty reduction impact is calculated using the poverty elasticity to mean-income of each of these household groups.

The authors apply this methodology to the case of Indonesia using the SAM of 1980. They find that agricultural and service sectors contribute more to overall poverty alleviation than industrial sectors. This is primarily accounted for by differences in the distributional effect (mainly the direct and indirect factor incomes). That is, the relatively low poverty alleviation effects of manufacturing activities are mainly explained by low direct linkages with the poor. Since the factor endowments of the poor households consist mainly of unskilled labor and manufacturing activities (in the Indonesian case) tend to require more skilled labor, the distributional effect of manufacturing activity is relatively weak.

After this seminal work, some other authors have followed the same methodology to evaluate the impact of different sectors on poverty alleviation in other countries. Khan (1999) applies this decomposition technique to analyze the case of South Africa, using the 1978 SAM. He finds that agriculture and mining activities have the largest poverty alleviation effects. Transport and other services take precedence over manufacturing activities. He also finds that within manufacturing, food and textiles have stronger poverty alleviation impacts than sectors such as paper and chemicals. According to the author, this is the reflection of the differences between these sectors in terms of backward linkages and the employment of unskilled African labor.

More recently, Dang (2011) has applied this to analyze the case of Viet Nam, based on a SAM constructed for the year 2003. In contrast to the previous studies, this author finds that the industrial sector has the largest impact on poverty reduction, followed by agriculture and then services. This is plausible given the very dynamic evolution of Vietnamese manufacturing.

Although the SAM approach is useful to trace the different mechanisms through which output growth in a given sector impacts upon poverty alleviation, it also has important limitations. Perhaps the most critical limitation is that this approach –at least as applied by these authors–is extremely static in nature. It takes the structure of the economy at a point in time as given and tries to identify which are the sectors that have the highest impact on poverty alleviation.

Therefore, it rules out important dynamic longer term effects associated with the reallocation of labor among different sectors of the economy.[26] The role of manufacturing as a driver of structural change cannot be captured using these techniques. Therefore some of the most important mechanisms through which manufacturing contributes to poverty alleviation are not being considered.

5.3. STRUCTURAL CHANGE AND POVERTY REDUCTION: INDIRECT AND INDUCED EFFECTS IN THE LONG RUN.

An important limitation in the approaches reviewed in Sections 5.1 and 5.2 is that they do not take the important role of structural change into consideration as possible major driver of poverty reduction in the long run. The economic structure of poor countries is typically dominated by rural agriculture and urban informal services. In the least developed economies, growth in these sectors will, therefore, obviously have an immediate positive impact on the incomes of the poor.

The historical experience of the successful cases of catching up (and thus, poverty reduction), however, demonstrates that relying only in these low productive activities does not constitute a pathway out of poverty traps. As extensively documented in the literature, rapid catching up goes hand in hand with a radical structural transformation of the economy towards activities with higher productivity and higher levels of technological sophistication (Amsden, 2001; Chenery, et al., 1986; Kuznets, 1979; UNIDO, forthcoming).

As in the case of the short run, the long-run effects of growth in manufacturing are direct, indirect and induced ones. Direct effects have to do with the long-run creation of employment within the manufacturing sector, indirect effects have to do with the creation of employment in other sectors that are linked to growth in manufacturing, induced effects refer to the long-run demand effects and technology spillover effects on employment reduction via aggregate growth[27].

As Gutierrez et al. (2007) put it clearly, a recurrent issue in this debate is "... *whether poverty is more effectively reduced by a growth pattern that favors the sectors of the economy in which the poor are found (i.e., agriculture) in order to enhance employment opportunities or by a pattern that disproportionately advances the sectors in which the poor are not found, so that more of the poor can be drawn into the higher earning parts of the economy*" (*ibid*., p. 3). As we have seen, most of the contributions discussed in section 5.2 seem to support the first alternative. On the other hand, other authors have also stressed the special role of manufacturing as a driver of structural transformation, acceleration of growth and poverty reduction, placing themselves in the second perspective. The role of manufacturing as an engine of growth, and thus indirectly of poverty reduction receives special attention in this section.

[26] One promising route for future research would be to use linked series of SAMS and Input Output data for a more dynamic approache. The data assembled in the World input output database (WIOD) of the Groningen Growth and Development Centre would be a valuable source for such dynamic studies.

[27] Induced effects may also include other externalities such as conglomeration effects, intersectoral complementarities, international knowledge acquisition, but the two effects highlighted here are amongst the most important ones.

Islam (2004), for example, provides support for the latter view. Using a very simple econometric framework for 23 developing countries during the 1990s, he regresses poverty (using the headcount measure as his dependent variable) against agriculture and manufacturing participation in labor force and finds that the share of agriculture in employment is positively and significantly related to poverty while the share of manufacturing in employment is negatively related to poverty. Based on this observation and cases studies of several developing countries, he concludes that the shift away from agriculture to manufacturing is associated with a reduction of poverty, thus validating the importance of structural shifts in employment. Although he recognizes the importance of growth in agriculture, he also emphasizes the importance of structural shift of employment towards higher productivity non-farm sectors.

A series of reports from the United Nations Industrial Development Organization (UNIDO) emphasizes the same point. UNIDO (2004) analyzes the experience of eleven high-performance economies[28] during the first twelve years after their take off. The general conclusion is that: "*...rapid growth in agricultural productivity is a precondition for economic take off and sustained poverty reduction. But the experience of these countries also supports the view that agricultural growth, especially at the initial stages of development, is not an end in itself but a vehicle for facilitating industrialization. Efforts to promote rural development and alleviate poverty can be more effective if rural incomes can be raised through small scale manufacturing activities, for example in agro-processing*" (*ibid*., p. 57).

In a similar vein, Fukunishi et al. (2006) argue that there has been rather little research on the impact of industrialization on poverty as the priority has been placed on the agriculture and the urban informal sectors because those are the sectors where most poor are located. They claim, however, that "*...development of the industrial sector can make a potentially substantial contribution to poverty reduction in low-income countries, in particular, in the long term, in the same way as the Industrial Revolution did for the present developed countries*" (*ibid*, p. 2). Bearing this fact in mind, they propose two pro-poor industrialization strategies: *agro-based industrialization* and *labor-intensive industrialization*.

Closely related, UNIDO (2009) highlights the important role of manufacturing on poverty alleviation and its advantages relative to agriculture and resource extraction. First, manufacturing would be better in creating opportunities for wage employment. This follows from the fact (already pointed out in chapter 2) that many manufacturing activities benefit from economies of scale in production. Thus as outputs grow, costs will decline. From the supply side, this would mean that the rate of creation of jobs can be explosive. In the past, when import substitution industrialization was the dominant paradigm, this process was countered by damping forces from the demand side. Since production was mainly oriented to domestic markets of limited size, the market became saturated. In the past decades, however, the global integration of manufacturing has relaxed this constraint via the export orientation of manufacturing. For this reason, the authors stress that the expansion of manufacturing wage jobs can be truly *spectacular*. Next, while agriculture and natural resource extraction depend on the availability of land, development based on manufacturing exports can continue and accelerate without facing such constraints.

[28] Chile, China, India, Indonesia, South Korea, Malaysia, Sri Lanka, Thailand, Viet Nam, Mauritius and Bangladesh.

Country-case studies also seem to confirm the important role played by manufacturing as a major driver of successful structural transformation, which in turn, lead to poverty alleviation. These studies, however, also stress the increasing difficulties faced by developing economies in achieving such transformation. A forthcoming UNIDO report on poverty reduction in the BRICS (UNIDO, 2012) argues that the two countries which experienced most structural change, namely China and India, had much more rapid declines in poverty than the two countries experiencing de-industrialization, Russia and South Africa. In India structural change favored both manufacturing and services, with the emphasis on services. In China, the most dramatic expansion was that of manufacturing which increased its share in GDP from 22 per cent in 1987 to 45 per cent in 2008. Of the BRICS countries it was China that experienced the most greatest success in reducing poverty.

In UNRISD (2010) the experience of different countries is analyzed in order to highlight the potential of different patterns of development to decrease poverty through their effects on employment. Five broad development paths are distinguished: *classic manufacturing growth path*; *industrialization with dualist labor market regimes*; service-led growth; *agriculture-dominated growth*; and *mineral-dominated growth*. The general conclusion is that the most successful cases in terms of poverty alleviation are found in those countries which managed to follow the first path. Among these countries, the authors analyze the experiences of South Korea, Indonesia, Malaysia, Thailand, China and Viet-Nam. In all these cases, significant reductions of poverty were achieved in a context of structural transformation from agriculture towards manufacturing.

Contrasting with these successful cases, many middle-income economies managed to industrialize but developed labor markets and social policy regimes that are highly dualistic (that is, economies with a formal sector that offers high wages, benefits, security and prospects for upward mobility; and an informal sector characterized by low incomes and less job security, training and mobility). This is the case for most Latin American countries and a few other developing economies such as South Africa and Philippines. Here, the sharp division of labor markets and the failure of the growth strategy to generate enough jobs that are adequately remunerated and protected make it difficult for the majority of the population to escape from poverty. Many of these countries are struggling to escape the middle-income trap.

According to UNRISD, the service-led growth path is represented by the cases of Ireland and India. Although in both cases significant reductions of poverty were achieved, the authors express some doubts on the sustainability in time and scope of such strategy (see also Ramani and Szirmai, 2012, below).

In the last two cases (agriculture dominated economies, represented by Kenya and Cambodia; and mineral rich countries, represented by Botswana), the authors emphasize the difficulties that these countries face in building a base of new, outward-oriented economic activities capable of achieving substantial poverty reductions.

From the analysis undertaken, the authors conclude that: "*Improving employment opportunities by taking the existing structure of employment as given is likely to be inadequate. The process of economic development involves the transformation of the structure*

of employment – not simply improving opportunities in existing activities. The long-term challenge is to move human resources into higher value added activities, raise the average level of labor productivity, and thereby increase wages and people's incomes" (*ibid*, p. 56). Nevertheless, they also highlight that the classic employment-generating growth path through industrialization is not being replicated in most of today's developing countries. Instead, most labor leaving agriculture goes into low-productivity activities in the informal service sector where the scope for sustained growth in productivity and improvements in incomes is limited.

A recent case study for India seems to confirm these conclusions. Using a long dataset on poverty and other variables, Aggarwal and Kumar (2012) analyze the relationship between structural change and poverty alleviation in India during the period 1951-2008.[29] Their approach departs from the contributions reviewed in Section 5.1 because instead of looking at the relationship between sectoral composition of growth and poverty reduction, they make an attempt to analyze how and through what channels structural change in GDP has impacted on poverty reduction at the national level. In order to do so, they estimate the following model using OLS:

$$POVCH = a_1 + a_2 GRTH + a_3 STRCH + a_4 WELFARE + a_4 PRICEIN + \theta_j + \mu_i \qquad (3.3)$$

where, *POVCH* represents the first difference in poverty, *GRTH* represents per capita growth, *STRCH* represents different measures of structural change, *WELFARE* represents different measures of government transfers, *PRICEIN* is the GDP deflator (used as a proxy for inflation), θ_j are five time dummies (1951-60; 1961-70; 1971-83; 1984-93; and 1994-2008), and μ_i is an error term.

The authors analyze four different measures of structural change: the norm of absolute values (*NAV*), defined as the differences of the sector shares between two points of time; the change in the agricultural value added share in total GDP (*CHAGSHARE*); the change in industrial share (*CHINDSHARE*); and the change in service share (*CHSERSHARE*). In addition, they include an interactive term between per capita growth and structural change (*PCYNAV*).

They find that although the coefficient for structural change is insignificant, the interactive term is positive and significant. That is, after controlling the effects of other variables, high growth associated with a rapid structural change seems to have led to higher poverty. Since the structural change in India was driven by expansion of services, they conclude that that service-led growth is not conducive to poverty alleviation.

Considering the change in the shares of each sector, they find that the increase in the share of industry on GDP is poverty-reducing, while services and agriculture are poverty-neutral. This is specially the case when they restrict the analysis to the effects on rural poverty.

From this analysis, the authors conclude that: "*poverty has indeed declined after the 1990 reforms but the average rate at which it declined decelerated. In the initial phases structural*

[29] This section is based on a preliminary version of Aggarwal and Kumar, cited with permission of the authors.

change that occurred did have a poverty reducing effect but the period of high growth and rapid structural change appear to have had a poverty enhancing effect. Interestingly, this period also witnessed acceleration in structural change in employment. But (...) shifts in sectoral distribution of employment have not been in favor of high productivity sectors. Labor that is released from agriculture gets absorbed in low productivity sectors where wages are significantly low. This seems to have inhibited the poverty reducing effects of growth. Our results show that the expansion in the share of industry in particular manufacturing can have large poverty reducing effects" (*ibid*, p. 48).

In a recent paper (already cited in section 3.4) Ramani and Szirmai (forthcoming) have compared the economic performance of India and China since the eighties. Till the late 1980s per capita incomes in the two countries were rather similar, with India at a slightly higher level. After 1990, China forged ahead while India experienced a growth acceleration of a more moderate nature. By 2010, per capita incomes constant 1990 PPP dollars were twice as high in China as in India. The difference between the recent performance of the two countries is due to the much more important role of manufacturing in China (in terms of GDP shares and employment shares) compared to the greater importance of services in India. It is clear that services are important for India's growth from an accounting perspective, but in terms of growth potential it seems that manufacturing performance is of key importance. This is in line with the analysis of the paper of Aggarwal and Kumar discussed above and with the findings reported in the forthcoming UNIDO report on the BRICS (UNIDO 2012).[30]

Poverty impacts: Low-income countries and middle-income countries

The discussions in this section raise an important issue, namely, how does a country's stage of economic development affect the preferred growth strategy for poverty reduction.

We have seen that at very low levels of per capita GDP, most poor are located in rural agriculture activities. At this stage of development, it seems that manufacturing has a crucial role in bringing these workers out of poverty via direct absorption of employment. Labor-intensive industries, therefore, are extremely important in escaping the poverty traps. Following Fukunishi et al. (2006), a labor-intensive industrialization strategy would bring the largest benefits in terms of poverty alleviation, because it will stimulate the rural-to-urban migration of the poor, providing them jobs opportunities with wages that are higher than the alternative rural employment opportunities. Furthermore, entry barriers for less educated workers (especially female) tend to be low in this type of industries. These elements, in turn, would bring further benefits to family members of these workers in terms of direct increases in consumption and physical, human and social capital for future generations.

The experiences of Bangladesh and Kenya (two low-income economies) expanding their garment industries provides some empirical support for this view. According to a field survey conducted by Fukunishi et al (2006) in these economies, earnings of garment workers without previous experience in the industry are not only above the national poverty line but also much higher than alternative income-generation opportunities offered in the rural farm sector. In

[30] the Aggarwal and Kumar paper is part of the UNIDO BRICS project.

addition, high levels of education are not a necessary requirement for employment in this sector and barriers against the employment of female workers are low. Finally, part of the remittances from the garment workers is often invested in the physical, human and social capital of the family in rural areas. In a related paper, Yamagata (2006) finds comparable results for the export-oriented garment industry in Cambodia. Based on firm-level data collected in 2003, the author confirms the substantial impact that employment in the garment industry has had on poverty reduction in this country. The wage rate for entry-level workers is much higher than the poverty line, entry barriers are low (especially for female workers) and promotion to higher quality jobs is not difficult. According to the author, employment in this industry thus offers wide scope for the poor to substantially increase their incomes.

In middle-income economies, the challenge is to sustain growth and escape the so-called *middle-income trap* (Felipe, 2012; Ohno, 2009). These countries face competition in labor-intensive manufactures from low-income Asian countries and competition from the advanced economies in technologically advanced lines of production. In a series of papers Keun Lee (Lee and Kim, 2009; Lee and Lim, 2001; Park and Lee, 2006) has argued that these economies need to pursue new industrialization strategies focusing on technological upgrading, competing in sectors where technological change is so rapid that the incumbent firms in advanced economies may have less advantages. This creates opportunities for leapfrogging and entry into new markets. The prime examples of escape from the middle-income trap and successful elimination of poverty are Taiwan and Korea. Their continued catch up has been driven by manufacturing.

Of course, as their levels of per capita income increase, the share of services in GDP and employment inevitably increases. At middle-income levels of development, high-tech and capital intensive manufacturing industries become more important for growth. These are less labor intensive, but provide more high-quality high-skilled jobs and have important spillover effects for growth (and thus indirect effects on further reductions in poverty). The direct effects of employment creation in manufacturing become less pronounced, the indirect and induced effects of manufacturing on aggregate growth become more important. The extent to which growth at middle-income levels impacts on poverty does not only depend on poverty elasticities via the mechanisms discussed in this paper, but also on social protection policies and distributive policies.

5.4. CONCLUDING REMARKS

In the 1950s and 1960s investment in manufacturing was seen as the key to economic development and poverty reduction (Szirmai, 2005). As time passed, the role of manufacturing increasingly came to be questioned. The focus on manufacturing had led to the neglect of other important sectors such as agriculture, with deleterious effects on overall economic development. In later years, the rise of market services in both advanced and developing countries made it clear that engines of growth can also be found in service sectors. As a result, there is a now a tendency to underemphasize or even neglect the importance of manufacturing in recent policy debates.

This report provides theoretical and empirical evidence for the continued importance of manufacturing as an engine of growth, employment creation and poverty reduction. Manufacturing plays this role in interaction with other important economic sectors such as agriculture and services. In the current debates about investment priorities and economic policies, manufacturing should continue to take a prominent place.

5.5. SUMMARY OF FINDINGS ON POVERTY ALLEVIATION

The findings of this chapter can be summarized as follows:

- While there is a large literature on the poverty elasticity of aggregate economic growth, less is known about sectoral contributions to poverty reduction. The empirical literature on the impact of manufacturing and other sectors on poverty alleviation is quite limited. Moreover, most of the existing studies do not adequately capture the various channels through which sectoral growth impacts on poverty reduction.
- Most efforts in the literature have focused on estimating the *Poverty Elasticity of Growth (PEG)* at the sectoral level, and comparing the results across different sectors.
- The literature suggests that in the short run a growth pattern that favors agricultural and informal activities is more effective in terms of poverty reduction than a growth strategy based on the secondary sector.
- Recent studies also document significant positive poverty reduction effects of growth in the secondary sector, especially in East Asia. The poverty reduction effects of the secondary sector are highest in developing countries with labor intensive growth.
- The PEG approach focuses mainly on direct effects and disregards important inter-sectoral interactions that are at the core of the economic growth process. Some studies have tried to capture these inter-sectoral effects using a decomposition technique that can be applied using Social Accounting Matrices (SAMs).
- Two SAM-based studies highlight the importance of the primary and agricultural sectors, one recent study on Vietnam points to the importance of manufacturing growth.
- Like the poverty elasticity approach, the methodology using social accounting matrices of a given year is static in nature. While it provides valuable information about the channels through which sectoral growth affects poverty, it takes the structure of the economy as given and fails to recognize the importance of key structural change in poverty alleviation.
- A strategy which focuses only on the improvement of low-income activities in agriculture sector cannot provide a way out of poverty traps. Structural change constitutes one of the major forces lifting countries and their populations out of poverty. Manufacturing industries play a key role in driving this structural transformation.
- Given the better labor conditions typically offered by manufacturing industries (in terms of wages, indirect benefits and promotion opportunities), shifts in labor from low productive activities (such as rural agriculture or informal services) to manufacturing has positive and persistent impacts on poverty alleviation.

- According to the literature reviewed, the role of manufacturing in employment creation is particularly important at early stages of development. In the poorest countries, the expansion of labor-intensive manufacturing industries has major potential for poverty reduction through its direct impact on the creation of new, better quality jobs. Countries which have missed out on these opportunities are the countries that have experienced little economic growth.
- In middle-income countries, the direct impact of manufacturing on poverty reduction through the creation of new jobs becomes less important. In these economies, the challenge is to sustain rapid growth. For these countries, a shift to high-tech and capital-intensive manufacturing industries becomes important. These industries are less labor-intensive, but provide more high quality high skilled jobs and have the greatest spillover effects for economic growth (thus indirectly inducing further reductions in poverty rates).
- In comparative perspective, manufacturing has played an important role in accelerated catch up.
- The impacts of the growth-enhancing effects of manufacturing on poverty reduction have been disregarded in much of the literature. If manufacturing is one of the important engines of growth – as argued in chapter 3 of this report –, then growth in other sectors of the economy is partly driven by manufacturing growth. The positive impact on poverty that results from manufacturing-induced economic growth needs to be taken into consideration when evaluating the role of manufacturing on poverty alleviation.

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