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Employment and productivity patterns in high-growth economies

The different role of manufacturing and commodities exports

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Abbreviations

LIC	Low income country
MIC	Middle income country
GDP	Gross domestic product
OLS	Ordinary Least Square Model
GMM	Generalised Method of Moments
ILO	International Labour Organization
UN	United Nations
UNIDO	United Nations Industrial Development Organization
H-O-S	Heckscheer-Ohlin-Samuelson model
WIOD	World Input-Output Data
UNCTAD	United Nations
OECD	Organisation for Economic Co-operation and Development
BRIC	Brazil, Russia, India and China

1 Introduction

In this paper, carried out under the DFID Economics and Private Sector Professional Evidence and Applied Knowledge Services (EPS-PEAKS) framework, we analyse the sectoral pattern of employment and labour productivity in those countries which have experienced high-growth episodes characterised by exports of manufacturing, agricultural and extractive goods, as identified by our previous study.

In particular, using a group of countries which have experienced rapid growth episodes (an average GDP growth rate higher than 7% for at least 20 years), we will differentiate between two subsets, the first characterised by a rapid growth of manufacturing exports, while the second group by exports of agriculture and extractive commodities.

Previous theories in the economic literature have predicted that sectors which have experienced an export-led growth might be responsible for a large part of the increase in total employment in the country (e.g. Krugman, 1995; Feenstra and Hong, 2007). In addition, export-led sectors should exhibit on average higher levels and growth of labour productivity, usually associated with “learning-by-exporting” phenomena (e.g. DeLoecker, 2013; Foster-McGregor et al. 2014).

To test these predictions for our sample of countries which experienced high growth export-led episodes, we use employment, trade and industrial output data at the country-sector level from 1960 till 2014 from the ILO, the UN and the UNIDO industrial statistics. Thanks to these data we are able to estimate the effect of export growth on employment and labour productivity with a dynamic model of sectoral trade and industrial output distribution. In this way, we will identify in each subsample the domestic and exporting sectors linked with employment growth and the productivity gains at the national level.

The results show that in both subsamples of countries most of the growth in employment has been linked with the expansion of the domestic demand, satisfied by an increase in the internal industrial output. The main exporting sectors have contributed partially to the increase of total employment in these countries, mainly thanks to the agricultural sector in the commodities-led group and to the manufacturing sectors in the industrialised sample respectively. As predicted by the economic literature, labour productivity instead seems to be mainly affected by exporting sectors, especially of manufacturing goods, finding evidence of “learning-by-exporting” phenomena.

2 Export-led employment and productivity growth

2.1 Literature Review

The economic literature on the relationship between trade, employment and productivity could be divided in two different strands. On one hand, part of the literature has studied the effects in developed countries, analysing the decrease in the demand for unskilled labour following trade liberalization (Wood, 1998; Autor et al., 1998; Berman et al., 1998). On the other hand, some works focused their attention on the case of developing countries, regarding especially the possible gains in terms of employment growth related to the switch to export-promoted trade regimes (Renshaw, 1981; Wood, 1994).

The main theoretical framework in this context has been the standard Heckscher-Ohlin-Samuelson (H-O-S). This theoretical model predicts that countries tend to export goods that use their abundant factor intensively, while they tend to import those goods that use their scarce factor intensively. As a result, the main predictions of the H-O-S model is that trade results in a redistribution of employment away from the import substituted sectors towards the leading exporting industries. However, the empirical applicability and the relevance of the H-O-S model have been widely questioned by more recent contributions and evidence. First of all, it has been demonstrated that most of the international trade in the last decades has been mostly driven by non-H-O-S factors, where a large proportion of trade is between countries with similar factor endowments (Greenaway et al. 1995). Secondly, the applicability of the H-O-S model to developing countries has been widely debated given its often unrealistic starting assumptions in particular about the workforce composition and the homogeneity of exporting firms in terms of productivity (Were, 2007).

Nevertheless, the H-O-S model provided a useful theoretical framework for the empirical analysis of countries export performance and its impact on the domestic labour markets and the productivity distribution. For instance, starting from the Heckscher-Ohlin-Samuelson framework, different economic theories have analysed the impact of trade on wages and employment through market size and factor content relocation. These studies have stressed the amount of skill, labour and capital embedded in trade process and tried to predict the relative changes in supply and demand of skilled and unskilled labour force across countries. For instance, according to the export demand effect, a first effect of the development of exporting sectors could be the increase of production and demand for labour force, creating new job opportunities in the exporting industries (Kaldor, 1970; Thirlwall, 2003).

In addition, the traditional export-led growth hypothesis suggested that external demand would enable firms to exploit economies of scale leading to productivity and employment growth (Dixon and Thirlwall 1975). Following endogenous growth models (Grossman and Helpman 1991, Rivera-Batiz and Romer 1991) predicted that international technology diffusion through exposure to export markets could boost as well within-industry productivity. Moreover, more recent studies have stressed that firms in exporting sectors could also invest in productivity-enhancing technology in anticipation of the opening of larger export markets, in order to be ready to face international competition (Yeaple 2005).

Another microeconomic channel through which exports might affect employment and productivity is the reallocation of economic activity across firms within industries. Models by Helpman and Krugman (1985) and Krugman (1995) predicted that the average productivity could rise if resources were shifted to industries with lower average costs. In addition, heterogeneous firm models (Melitz 2003 and Bernard et al 2003) also argue that the existence of trade costs allows only the most productive firms to enter export markets.

As low productivity firms exit, output and employment are reallocated towards higher productivity firms which are able to enter foreign markets, and as a result the average industry productivity increases. In other words, it is the reallocation of activity within industry towards exporting firms, and not within-firm that drives industry-level productivity growth.

At the aggregate level, two main strands of the literature have been followed in order to evaluate empirically the impact of trade on employment and labour productivity. First, part of the studies focused on *factor content* analysis, trying to estimate the amount of labour required to produce a given amount of exports. These studies usually exploited input-output data including both labour force and other intermediary goods as inputs. Thanks to the input-output methodology it is possible to estimate both the direct and indirect effects of exports on productivity and domestic employment, taking into account the intra-industry flows of the production process of exporting goods (Feenstra, 2007). For instance, following this approach Sapir and Schumacher (1985), Wood (1994), Baldwin (1995), Krugman (1995) and Cortes (1996) examined the effects of increased trade of developed countries with other developed and developing countries on wages and employment. Generally, they all find evidence of modest negative effects on unskilled labour employment especially in the import competing sectors in developed countries.

However, trade liberalisations is usually related with productivity gains, not only in the exporting industries thanks to the "learning-by-exporting" phenomenon, but also in the importing sectors thanks to the introduction of new capital and technologic-intense intermediate inputs from more developed countries. For instance, Feenstra and Hong (2007) and Chen et al. (2012) found similar evidence for the case of China and newly emerging countries. Even in the case of a developing country, the authors estimated that export growth contributed to a modest increase of domestic employment, which instead is mainly driven by the growth in domestic demand especially of non-tradable products. Similarly, manufacturing exports seem to increase just marginally industrial productivity, which instead has been mostly positively affected by economic reforms and the rapid growth of the internal final demand.

A second strand of the empirical literature has followed instead a *growth accounting* approach, decomposing the sources of employment change into domestic demand, trade performance and patterns of industrial wages and productivity. The main findings highlight how trade performance usually had a minor effect on employment, especially in developed countries, while productivity growth and the development of the services industry are the main factors affecting labour in the short run (OECD, 1992; Gregory and Greenhalgh, 1997; Messerlin, 1995). However, the *growth accounting* approach presents some methodological flaws, especially regarding the main assumption that the different components of employment change are individually independent. For instance, if increasing exports stimulated faster productivity growth there would be an additional indirect effect of trade not picked up by this method (Martin and Evans, 1981; Wood, 1994). In particular, several studies predicted that productivity growth might be stimulated by pro-competitive and efficiency trade effects (Caves and Kreps, 1993), reducing the cost of inputs of production (Borjas and Ramey, 1994) or through the relocation and the offshoring abroad of the most labour-intensive and low-skilled stages of production (Feenstra and Hanson, 1996). Different empirical studies have tried to mitigate this source of unobservable heterogeneity, especially linking increased trade volumes to the growth of labour productivity and introducing proxies of trade-induced productivity effects in the estimation of the impact of international trade on labour markets (Cortes and Jean, 1996; Lawrence, 1996; Greenaway et al. 1999).

2.2 Data and Preliminary Statistics

To test whether the exporting sectors which have characterised the rapid economic growth are also associated with increased levels of employment and gains in terms of labour productivity, we use a dataset specifically assembled from a range of different sources, building in this way an integrated database of industrial output, labour market and trade statistics.

We focus our attention on a sample of 40 countries which have experienced high GDP growth episodes since 1960 at an average rate above 7% for a period of at least 20 consecutive years, as identified in a previous EPS-PEAKS study (Vanino, 2015). As previously shown, some of the growth episodes in these countries have been associated with exports of manufacturing, agricultural products and hard commodities, and we would like to investigate whether employment and labour productivity have been affected by this surge of sectoral exports as well.

Table 1: Countries which experienced high growth episodes between 1960 and 2014.

Country	Av. GDP Growth	Period High Growth		GDP per capita (start/end)		Country	Av. GDP Growth	Period High Growth		GDP per capita (start/end)	
Angola	7.29	1993	2013	464.78	5783.37	*Iraq*	10.97	1961	2013	245.00	6862.50
Algeria	7.60	1963	1982	222.72	2176.92	*Israel*	7.34	1961	1981	1595.86	5863.58
Azerbaijan	8.25	1994	2013	436.19	7811.62	*Jordan*	15.99	1961	1993	412.92	1435.29
Bhutan	13.91	1981	2013	328.66	2362.58	*Kenya*	7.01	1962	1981	100.60	405.56
Bosnia	20.80	1995	2013	343.17	4661.76	*Laos*	7.10	1994	2013	324.89	1660.71
Botswana	11.93	1961	2002	61.30	3006.59	*Lebanon*	7.43	1972	2009	1050.12	8274.14
Brazil	7.35	1961	1980	203.19	1930.54	*Liberia*	8.73	1991	2013	168.44	454.34
Cabo Verde	8.45	1962	2013	406.44	3767.12	*Malaysia*	7.18	1961	1997	287.42	4593.67
Cambodia	9.10	1975	2013	251.43	1006.84	*Maldives*	10.13	1984	2012	617.92	6243.85
Chad	7.41	1994	2013	174.65	1053.66	*Malta*	9.99	1961	1993	828.44	7428.48
China	7.26	1962	2013	70.12	6807.43	*Mozambique*	7.37	1993	2013	136.15	605.03
Congo	7.28	1964	1985	164.83	1039.42	*Oman*	23.46	1961	1998	80.78	6487.56
Cyprus	12.01	1961	1995	976.33	14212.05	*Rep. Korea*	8.88	1961	2005	91.48	18657.46
Eq. Guinea	7.17	1976	2013	453.57	20581.61	*Saudi Arabia*	12.91	1961	1988	781.00	5841.76
Ethiopia	7.66	1993	2013	165.50	505.05	*Singapore*	9.22	1961	2007	448.96	39223.53
Gabon	8.08	1961	1984	332.77	4427.91	*Swaziland*	7.11	1962	1992	125.58	1415.02
Hong Kong	7.88	1961	1996	483.18	24818.15	*Syria*	8.08	1961	1988	199.31	901.73
India	7.03	1988	2013	361.93	1497.55	*Thailand*	7.65	1961	1997	107.61	2506.21
Indonesia	7.09	1967	1997	56.63	1078.47	*Uganda*	7.03	1990	2012	245.48	652.75
Ivory Coast	7.18	1961	1980	171.64	1231.09	*Vietnam*	7.10	1988	2011	401.88	1543.03

Source: Elaboration based on WB Development Indicators data.

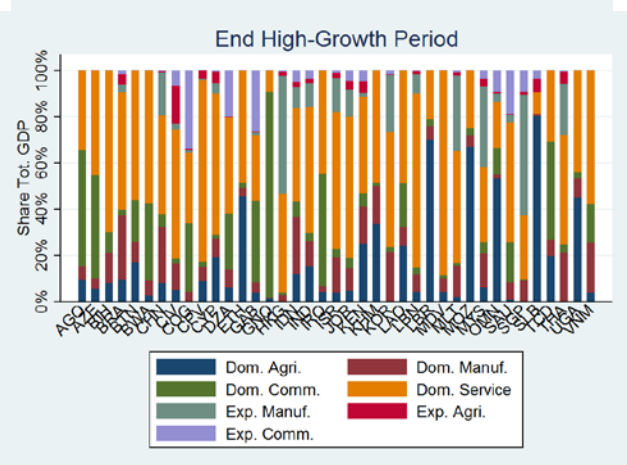
First, we obtained detailed data on the level of employment at the country level from the ILO dataset between the 1970 and 2014. Just for a limited number of countries in our sample it is possible as well to disaggregate this information at the sectoral level, distinguishing between the labour force employed in the agricultural, manufacturing, mining and service sectors[1].

Secondly, we included data on the industrial structure of these countries from the UNIDO database which cover the period 1963-2014. This unique dataset provided by the UN offers a wide range of information about the industrial output of selected countries at the sectoral level, the repartition between domestic output, exports and imports, and further data about the level of labour remuneration and productivity. In particular, thanks to this

1 Just for the following countries in our sample the level employment disaggregated at the sectoral level is available: Azerbaijan, Bhutan, Botswana, China, Cyprus, Ethiopia, Equatorial Guinea, Hong Kong, India, Indonesia, Iraq, Israel, Cambodia, Israel, Rep. of Korea, Liberia, Malaysia, Oman, Singapore, Syria, Thailand, Uganda and Vietnam.

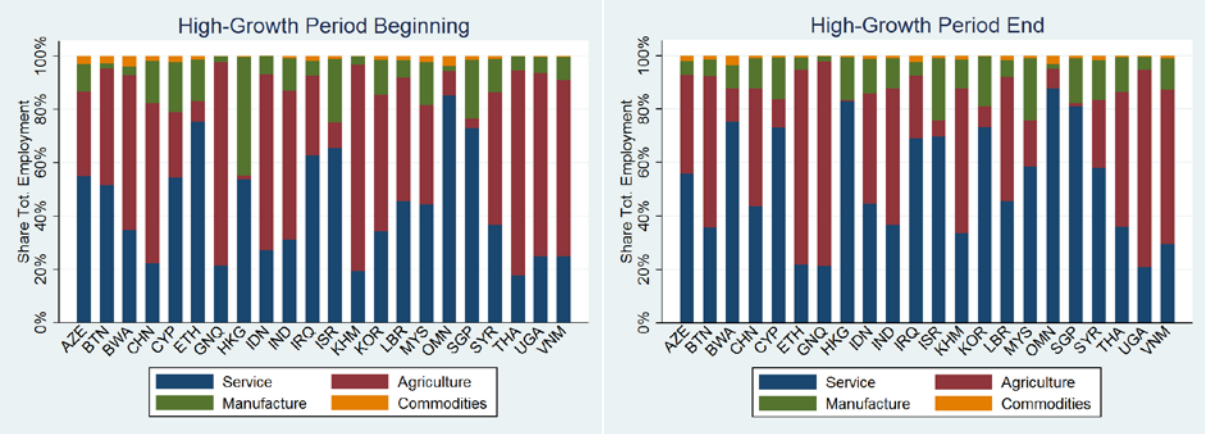
dataset it is possible to calculate the average labour productivity as the ratio between added-value and labour force employed in the manufacturing sectors, the average salary at the sectoral level and the sectoral output directed towards the internal market or for foreign sales.

Figure 1: Sectoral contribution of internal and foreign markets to the GDP by country at the beginning and at the end of the high-growth episodes



Source: Elaboration based on UN National Accounts Database and UN COMTRADE International Trade Statistics. In addition, we collected trade data at the sectoral level from the UN COMTRADE International Trade Statistics and from the UNCTAD trade statistics database. These two sources provide data about the total value of exports for all the countries in our sample since 1960. In addition, it is possible to disaggregate at the sectoral level in order to differentiate between exports of agricultural products, manufacturing and other hard commodities[2].

Figure 2: Sectoral employment by country at the beginning and at the end of the high GDP growth episodes.



Source: Elaboration based on ILO Statistics.

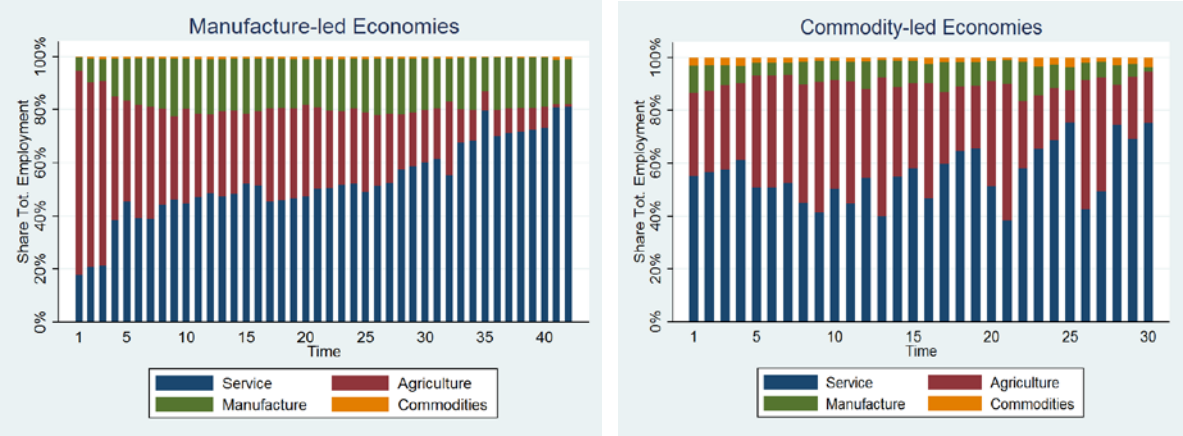
Finally, thanks to the time-series econometric analysis carried out in our previous EPS-PEAKS study, it is possible to differentiate our population of countries in two main subsamples. The first including all the countries which have experienced high growth episodes associated with manufacturing exports (Bosnia, Brazil, China, Hong Kong, India, Indonesia, Israel, Malaysia, South Korea, Singapore, Thailand and Vietnam), while the second group including those economies which instead have been linked with exports of agricultural products or of other extractive commodities (Angola, Azerbaijan, Bhutan, Cambodia, Chad, Liberia, Ethiopia, Ivory Coast, Laos, Lebanon, Jordan, Mozambique, Oman and Uganda).

We expect international trade to affect employment and productivity following different pathways through market size and factor content relocation. In particular, as previously stressed in the literature review, the development of exporting sectors should increase the

2 Unfortunately, due to gaps in the data we are not able to provide a comprehensive econometric analysis for all the countries which should be part of our sample of economies which have experienced high growth episodes driven by manufacturing and commodity exports.

production and the demand for labour force, creating new job opportunities in the exporting industries. In addition, external demand should enable firms to exploit economies of scale leading to productivity and employment growth. This should happen through the diffusion of international technology, the exposure to foreign markets ("learning-by-exporting") and the reallocation of resources towards higher productivity firms which are able to enter foreign markets, and thus increasing the average industry productivity.

Figure 3: Evolution of the sectoral employment during the high-growth period in the manufacture and commodity-led economies.



Source: Elaboration based on ILO Statistics.

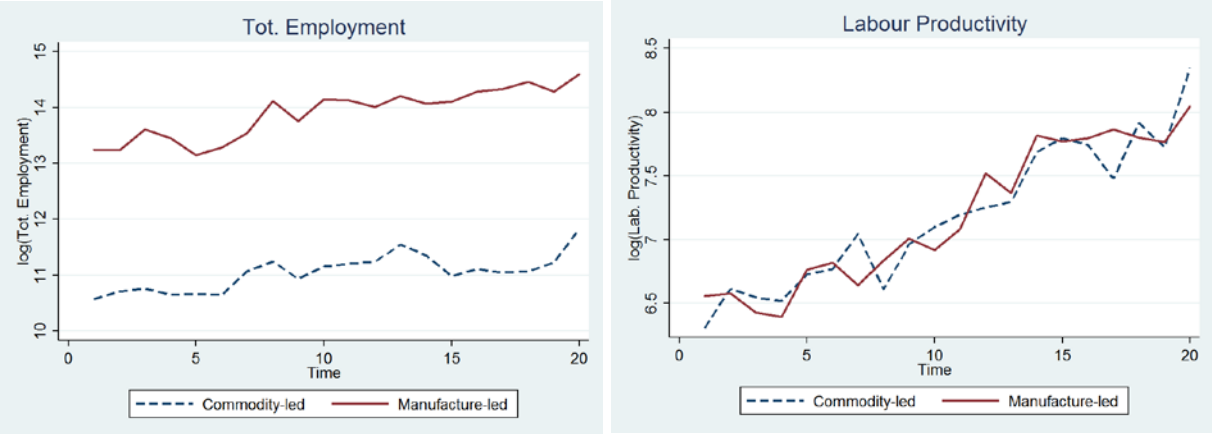
We start our analysis looking at repartition of the total output between domestic and export-oriented sectoral production in the countries part of our sample at the beginning and at the end of the high-growth episodes. To do so, we differentiate for each sector (agriculture, manufacturing, service and hard commodities) between the share of domestic and foreign sales over the total[3]. In figure 1 it is possible to notice that in most of the countries after the growth period the domestic service sector has drastically increased its share of the total GDP.

On the contrary, except for some cases, the domestic production of agricultural goods has decreased over time, while the output of the manufacturing and commodity sectors for the domestic market did not vary significantly during the high-growth period. It is interesting to notice that for most of the countries the contribution of exports to GDP has rapidly increased during these episodes, in particular in terms of manufacturing goods and raw materials, suggesting an evolution of GDP composition from agricultural production for the internal market to an export-oriented production of manufacturing goods and commodities.

We turn our attention now to the analysis of industrial transformations and the use of labour force and productivity in our sample of countries. Figure 2 presents the sectoral distribution of total employment at the beginning and at the end of the high GDP growth episodes for the countries which provided disaggregated employment data. It is possible to notice that in most of the countries after the high growth episodes, the sectoral distribution of employment has mainly shifted from the agricultural sector which employed on average more than 50% of the overall population to the service sector. In addition, the shares of employment of the manufacturing and extractive sectors have not significantly changed during the export-driven high economic growth periods, except in the case of Hong Kong.

3 We are not able to include international trade in services in our analysis since these data for low-middle income countries during the periods of interest are particularly limited.

Figure 4: Trends of employment and labour productivity levels for countries which experienced a high GDP growth driven by export of manufacturing or exports of commodities[4].



Source: Elaboration based on ILO and UNIDO data.

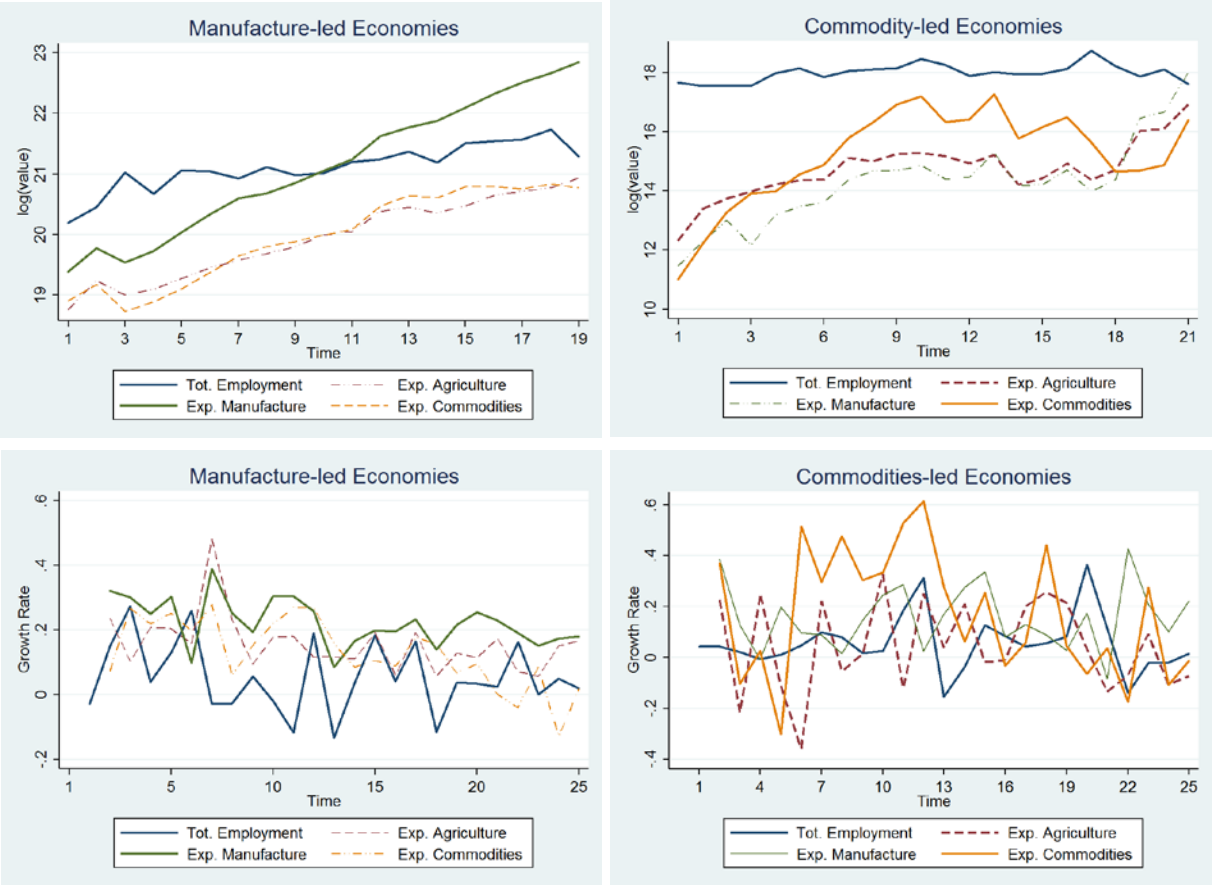
It is then possible to deepen this analysis by distinguishing between economies mainly characterised by manufacturing or hard commodity and agricultural exports[5]. Figure 3 presents the evolution of the sectoral employment during the high-growth periods in the two different sub-samples. From the graphs two different trends clearly emerge. In manufacturing-led countries employment in the service sector has rapidly replaced the share of employment in the agricultural sector during the high-growth episodes, representing at the end on average 70% of the total employment in these countries. On the contrary, employment in the manufacturing sector after an initial rapid increase remained stable at almost 20% of the total employment for the rest of the high-growth periods. Things are different in the economies characterised by exports of agricultural products and other commodities. Here in fact despite a fluctuating increase of employment in the service sector, the share of total employment of the agricultural and extractive sectors kept on a stable level, suggesting an overall instability of the employment shares during the high-growth episodes in these countries. This evidence highlights how even if exporting sectors have been important for the economic growth, apparently they did have different impacts on the sectoral distribution of employment in the two different sub-samples of economies.

Thanks to the UNIDO and the ILO datasets we are able as well to investigate the overall effect of exports and economic growth on the total level of employment and of labour productivity. Figure 4 presents an initial comparison of the trends of the levels of employment and labour productivity during the episodes of high economic growth distinguishing between the two groups of countries characterised by export in manufacturing or exports of commodities. First the graph on the left-hand side suggests that countries which have experienced a high economic growth linked with exports of manufacturing goods have employed on average a larger number of workers than countries characterised by exports of commodities. In addition, both samples of economies have experienced a weak growth in the overall level of employment during these high-growth episodes, despite a preliminary phase of employment adjustments and variability in the first years of economic growth shown by countries characterised by manufacturing

4 Following the UNIDO methodology, we measure labour productivity as manufacturing value added per employee in constant prices. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources. Data are in constant 1995 US dollars.
5 We define as “manufacture-led” countries those economies in which the share of manufacturing as percentage of total exports during the high-growth period is significantly higher than overall share of exports of agricultural products and hard commodities, while as “commodity-led” in the opposite case. We have aggregated countries in these two groups averaging the share of each sector to total employment by year, considering as time t=1 the starting year of the high-growth episode in each country.

exports. However, it is possible to notice from the graph on the right-hand side how labour productivity has experienced a rapid increase in both sub-samples of countries during the periods of high-economic growth. This evidence might suggest that, despite a bland effect on the total level of employment, export-intensive economic growth may be positively correlated with a substantial gain in terms of labour productivity, regardless of whether it was associated with exports of manufacturing goods or agricultural and extractive commodities.

Figure 5: Value and growth rate of total employment and sectoral exports in manufacturing and commodities-led economies.

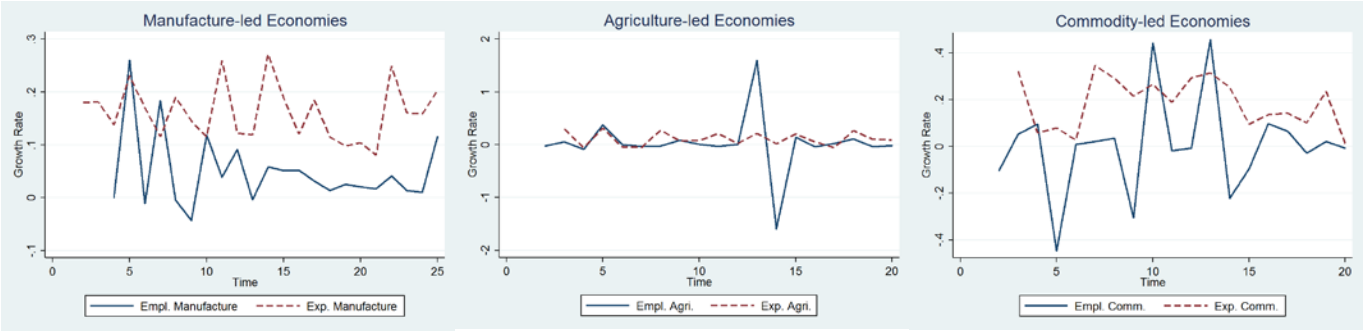


Source: Elaboration based on ILO and UNIDO data.

For this reason we deepen our analysis by looking more carefully at the relationship between exports, employment and labour productivity. In figure 5 we present the trends of the levels and growth rate of sectoral exports and total employment during the episodes of high economic growth distinguishing between the two subsamples of countries characterised by manufacturing or by commodities exports. In these figures it is possible to find some preliminary evidence of unrelated patterns of total employment and sectoral exports in both subsamples. In fact, despite sectoral exports have constantly increased during the high economic growth episodes, the level of total employment in both subsamples has increased less than proportionally. In addition, figure 5 shows that the year-by-year growth of sectoral exports have been completely unrelated from the yearly variation of total employment, not only in the countries characterised by exports of manufacturing products, but also for those economies mostly relying on the exports of agricultural goods and extractive commodities. These graphs show how exports and employment levels seem not to have any correlation during the episodes of high economic growth, as predicted by previous studies analysed in the literature review, even when differentiating between different sectoral exports and distinguishing between manufacturing or commodities-led economies.

It is possible to find further evidence of the previous prediction analysing the correlation between sectorial export and sectoral employment growth in the manufacture, agricultural and hard commodity economies. Figure 6 presents separately the growth rate of sectoral exports and employment in each of the three groups for a small number of countries in our sample which provided disaggregated data about the labour force employed in each sector. In none of the groups it is possible to distinguish a joint pattern of development between total employment and export growth at the sectoral level during the episodes of high economic growth, except in the case of agricultural exports-driven countries which exhibit a similar but flat growth of employment and exports.

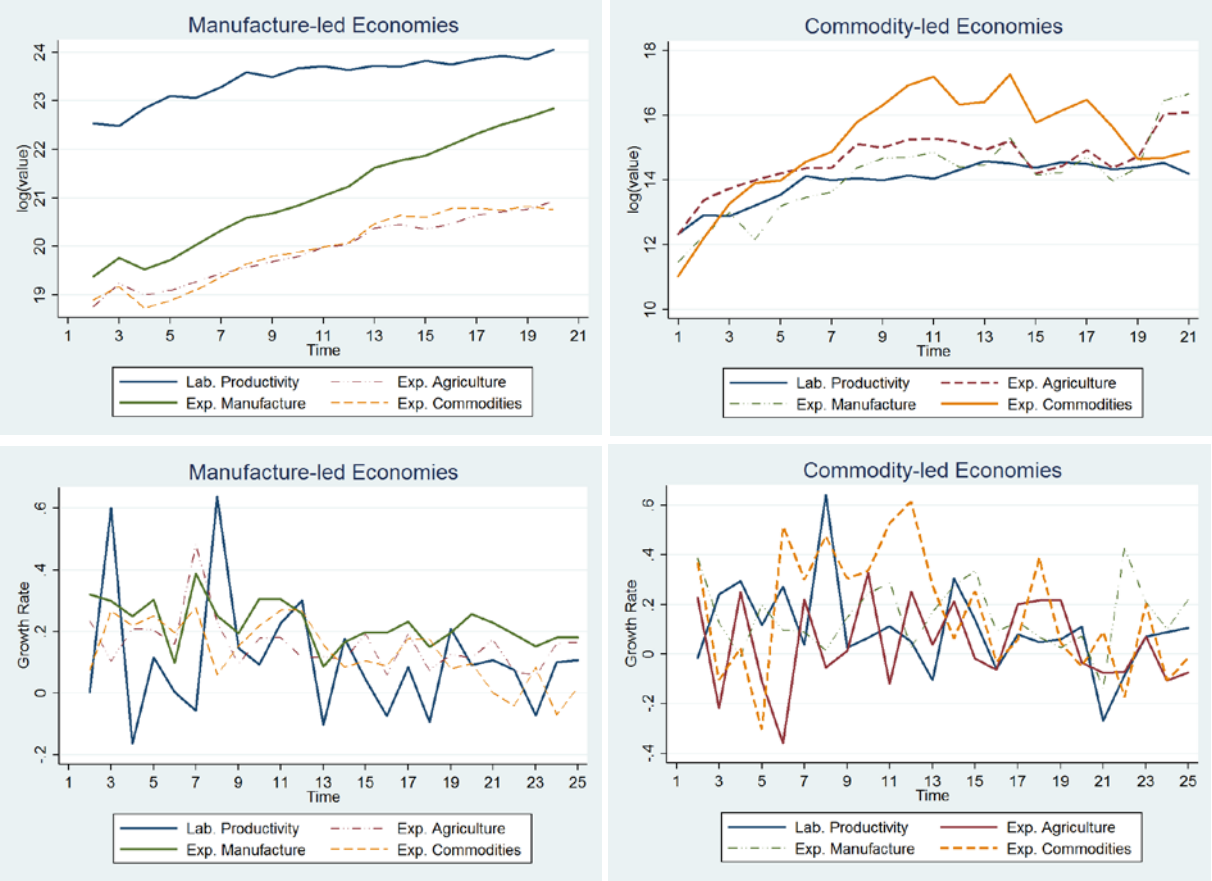
Figure 6: Correlation between sectorial export and employment growth in the manufacture, agricultural and commodity-led countries.



Source: Elaboration based on ILO and UNIDO data.

In figure 7 instead we look at the relationship between the value and growth rates of labour productivity and the sectoral exports in both manufacturing and commodity-led economies. As previously noted, also in this case the evolution of labour productivity in the countries that have experienced a high-economic growth is completely different from the trend of total employment. For instance, it is possible to notice that the value of labour productivity increased during the high-growth episodes following the surge of exports. This is particularly true in the case of economic growth episodes characterised by exports of manufacturing products. As highlighted in the graphs on the left-hand side, both the value and the year-by-year growth of labour productivity in these countries have followed the trend of manufacturing exports. Furthermore, it is possible to notice a similar phenomenon also for those economies mostly relying on the exports of agricultural goods and extractive commodities, where the increase of labour productivity seems to be particularly correlated with the growth of agricultural exports, suggesting a particular role played by exports of manufacturing and agricultural goods, but not by exports of hard commodities, in improving the overall productivity of a country.

Figure 7: Value and growth rate of labour productivity and sectoral exports in manufacturing and commodities-led economies.



Source: Elaboration based on ILO and UNIDO data.

2.3 Methodology

We test these preliminary findings estimating an econometric model of labour demand, industrial structure and export performance. As highlighted in the literature review, there are several limitations associated with the econometric techniques used so far to estimate the impact of increased exports on total employment. First, *factor content* analysis relies mainly on input-output data in order to consider both the direct and indirect effects of exports on productivity and domestic employment. Unfortunately, input-output tables have been harmonized and released mainly for developed countries (mainly the WIOD dataset for EU member states and the OECD data) and for some major developing economies (generally for the BRICs). Relying on input-output data would have meant to restrict our analysis to just a few countries in our sample, mostly countries which have experienced high economic growth episodes driven by the exports of manufacturing goods, and almost no observations for exports in commodity-led economies. In addition, the *growth accounting* approach, which decomposes the sources of employment change into domestic demand, trade performance and patterns of industrial wages and productivity, presents some methodological drawbacks as well, in particular regarding the assumption that the components of employment change are independent.

For these reasons, we decide to adopt a regression based approach grounded on a *growth accounting decomposition* method to estimate the effect of increased exports on

employment and labour productivity and developing then a dynamic model of labour demand[6].

As previously explained, we expect that the development of exporting sectors should increase the production and the demand for labour force, creating new job opportunities in the exporting industries. In addition, external demand should increase labour productivity through the diffusion of international technology, the exposure to foreign markets ("learning-by-exporting") and the reallocation of resources towards higher productivity firms which are able to enter foreign markets.

Starting from a Cobb-Douglas production function it is possible to derive the industry-specific demand for labour N_{it} which includes the costs and quantity of labour (w) and capital (w) which will maximize industry's profits for the production of a given amount of output (Q):

$$N_{it} = \gamma_0 + \gamma_1 X_{it} + \gamma_2 Q_{it} + \gamma_3 (w/c)_{it} + \gamma_4 T$$

In addition, following this approach it would be also possible to take into consideration that the technical efficiency of the production process might increases over time T, and that the rate of technological adoption and the increase in efficiency could be correlated with the changes in trade performance. In this way we will be able to reduce the biasedness of the *accounting decomposition* approach, considering that productivity growth in some industries might be stimulated by pro-competitive and efficiency trade effects, in particular reducing the cost of inputs of production and introducing new technologies thanks to the exposition to international markets competition.

Moreover, there might be costs associated with employment adjustment as the employment equilibrium may deviate from its steady state. For these reasons we decide to implement a dynamic model of employment which includes the introduction of lags of employment into the previous function in order to consider the different adjustment costs and to allow for heterogeneous effects (Greenaway et al. 1999). A dynamic structure may also be necessary if serially correlated technology shocks are present, and to take into account the effects of expectations formation about wage and output levels. To do that, we specify the explanatory variable in our model in dynamics terms, estimating the following general dynamic model for the panel of countries included in our study and differentiating between countries which have experienced high growth episodes characterised by manufacturing exports or by the exports of agricultural goods and extractive commodities:

$$\Delta lnN_{ct} = \gamma_0 + \gamma_1 \Delta lnX_{ict-1} + \gamma_2 \Delta lnQ_{ict-1} + \gamma_3 \Delta lnw_{ct-1} + \gamma_4 \Delta lnLP_{ct-1} + k_c + k_t + \varepsilon_{it}$$

In order to take into account the possible spillover effects of sectoral export growth also on different sectors, we decided to estimate the overall effect on the total employment N_{ct} in country *c* at time *t* of X_{ict-1} and Q_{ict-1} which represent the sectoral distribution of exports and domestic output differentiating between agricultural, manufacturing and extractive commodity industries at time t-1. In addition, following the previous literature on this topic (Greenaway et al. 1999; Were, 2007), we include in our model a number of control variables in order to provide an unbiased estimation of the effect of exports on employment which is not affected by unobserved heterogeneity. For this reason, in our model we include the average real wage in each country w_{ct-1}, the labour productivity LP_{ct-1} calculated as the ratio between the added value and the amount of labour force employed in each country at time *t-1*. In this way the independent variables, such as exports, domestic output, wages and labour productivity, are predetermined and exogenous in respect to employment growth. Moreover, we include country and time fixed-

6 A few studies have previously used this regression based technique to estimate the effect of trade on employment and productivity. Abowd and Lemieux (1990) and Caves (1990) applied it to US data to look at the impact of import competition on wages and employment. Denny and Machin (1991) and Konings and Vandenbussche (1995) applied it to UK firm-level data, while Greenaway et al. (1999) also examined the effect of trade on employment in the UK using industry-level data.

effects k_c and k_t in order to control for unaccounted differences between countries which are constant over time and any other year specific shocks.

Similarly, we follow an analogous model to estimate the impact of sectoral exports growth at time *t-1* X_{ict-1} on the overall labour productivity in the country LP_{ct}. In particular, also in this case we control for the effect of both sectoral exports and domestic output, differentiating between agricultural, manufacturing and hard commodity industries. In addition, we include in our model a number of control variables such as the growth rate of total employment in the country N_{ct-1} as well as including country and time fixed-effects k_c and k_t:

$$\Delta lnLP_{ct} = \gamma_0 + \gamma_1 \Delta lnX_{ict-1} + \gamma_2 \Delta lnQ_{ict-1} + \gamma_3 \Delta lnN_{ct-1} + k_c + k_t + \varepsilon_{it}$$

We start by estimating the two equations using an OLS fixed-effect method in which the variables are differenced so as to pick the causal effect of an increase in sectoral exports on the growth of employment and labour productivity, while implementing country and year specific fixed effects. However, differencing all the dependent and independent variables will induce a bias in the coefficient on the dependent variables because of the correlation with the unobserved fixed effects in the residual. In addition, the two estimations might suffer of endogeneity problems in particular if it subsists a reverse causal link with some of the control variables – such as in the case of labour productivity and employment level - or if we are in presence of a problem of selection – in particular in the case of self-selection of more productive sectors and countries into foreign markets activities (see for instance Feenstra and Hong, 2007).

For this reason we decide to adopt an instrumental variable approach by implementing the generalised method of moments (GMM) technique of Arellano and Bond (1991). This dynamic approach uses further lags of the possible endogenous variables as instruments and it expands the instrument set as the panel progresses and the number of potential lags increases, providing unbiased and consistent estimates of the regression coefficients. Using up to two-periods lagged values of the possible endogenous variables as instruments we will be able to consider the independent variables as predetermined and therefore not correlated with the error term but expected to influence total employment and productivity. To evaluate the overall goodness of fit of the GMM models we perform the Sargan and the Hansen tests of overidentifying restrictions which confirm the exogeneity of the subset of instruments and we test for the presence of first and second order serial autocorrelation.

2.4 Results

The results of our model estimations are presented in the following tables. Table 1 and table 2 report the estimations of the effects of the growth of sectoral exports on the growth of total employment and labour productivity using the OLS fixed-effects model. Table 3 and table 4 instead present the estimations of the same models but applying the dynamic GMM estimator. All the tables report three sets of estimates: the first one for the general sample of targeted countries which have experienced high economic growth episodes; the second one for the subsample of countries for whom the economic growth has been characterised by an increase in the exports of manufacturing products; and the last for the subsample of economies linked with exports of agricultural products or other extractive commodities.

Table 2: The relationship between sectoral exports and total employment (OLS fixed-effects)

Tot. Employment	***General***	***Manufacturig-led***	***Commodity-led***
Agri. Export	0.0282	0.142*	0.0412
	(0.0381)	(0.0524)	(0.0715)
Manuf. Export	0.00443	0.202*	0.00585
	(0.0270)	(0.0756)	(0.0293)
Commod. Export	-0.00285	0.152*	0.000967
	(0.0155)	(0.0514)	(0.0254)
Lab. Productivity	-0.797***	-0.751***	-0.923***
	(0.0804)	(0.0786)	(0.115)
Wages	-0.252***	-0.0690	-0.181
	(0.0708)	(0.0729)	(0.106)
Agri. Domestic	0.121**	0.359**	0.208*
	(0.0478)	(0.0918)	(0.108)
Manuf. Domestic	0.0767***	0.124***	0.106
	(0.0214)	(0.0143)	(0.100)
Comm. Domestic	0.0714***	0.0195	0.0634
	(0.0217)	(0.0127)	(0.0587)
Observations	244	137	107
No. Of Countries	23	10	13

We start analysing the results of the panel fixed-effect model in table 1 and table 2. From table 1 it is possible to notice that sectoral export growth in our general sample of countries which have experienced high economic growth episodes does not seem to play any significant role in increasing total employment, for none of the different sectors. On the contrary, domestic output seems to increase the level of derived labour demand particularly in the case of agricultural and manufacturing goods produced for the internal markets. At the same time, average wages and labour productivity in each country have a negative effect on total employment, as predicted by the literature on this topic previously revised in the above literature review.

Then, we continue our analysis disaggregating our sample in two groups, looking at the effect of export growth on total employment for countries characterised by manufacturing exports and those instead linked with exports of agricultural and extractive commodities. From table 1 it is possible to notice that increased exports in all the three main sectors have a positive and slightly significant impact on the growth of total employment in the countries characterised by the exports of manufacturing products. When looking instead at commodity-led economies this effect disappears, and even the domestic output has a positive and significant effect on the growth of total employment just for the domestic production of the agricultural sector.

In table 2 we present the estimations of the effect of increased sectoral exports on the growth of labour productivity always applying an OLS fixed-effects model. Looking at the general sample, it is possible to notice that only manufacturing exports play a role in improving the average labour productivity in these countries. This evidence is corroborated by the fact that just the manufacturing output for the domestic market seems to have a slightly positive effect on labour productivity, but none of the other two sectors. In addition, it is worth noting that previous levels of employment do not seem to affect labour productivity, as we might have expected following the previous literature.

Table 3: The relationship between sectoral exports and labour productivity (OLS fixed-effects)

Lab. Productivity	*General*	*Manufacturig-led*	*Commodity-led*
Agri. Export	-0.165	-0.783**	0.116
	(0.120)	(0.311)	(0.149)
Manuf. Export	0.241**	0.311**	0.349
	(0.108)	(0.126)	(0.299)
Commod. Export	-0.0845	0.00400	-0.0597
	(0.0683)	(0.187)	(0.0818)
Employment	0.0894	-0.00624	0.0518
	(0.0609)	(0.116)	(0.0990)
Agri. Domestic	0.150	0.305	0.0214
	(0.199)	(0.390)	(0.268)
Manuf. Domestic	0.368**	0.580**	0.161
	(0.163)	(0.284)	(0.230)
Comm. Domestic	0.226	0.141	-0.282
	(0.217)	(0.436)	(0.350)
Observations	244	137	107
No. of Countries	23	10	13

When we distinguish between manufacturing and commodity-led economies, the main results widely differ. First of all, it is possible to notice that in the case of manufacturing-driven economies, exports of manufacturing goods have a greater positive impact on productivity gains, while again just the manufacturing output for the domestic market seems to increase labour productivity. When we analyse instead this relationship in countries which have experienced a high economic growth linked with exports of commodities, we found that none of the sectoral outputs for the domestic market play any significant role in improving labour productivity. These findings support the theoretical prediction that especially developing countries might increase their overall productivity levels if exposed to international competition. In particular this might happen thanks to positive spillovers associated with the so called “learning-by-exporting” phenomenon (Bleaney et al. 2000; Choudhri and Hakura, 2000; Foster-McGregor et al. 2014). As a matter of fact, developing their international activities abroad, emerging countries might acquire new market information and know-how, increasing technology inflows which are useful for process upgrading and the restructuration and upgrade of the domestic industrial structure, as well as for productivity and quality management improvement.

We turn now to the estimation of the impact of sectoral exports on total employment and the average labour productivity applying a dynamic GMM method. We will be able in this way to instrument the possible endogenous variables with more lags after the *t-1* period, considering the independent variables as predetermined and therefore not correlated with the error term but expected to influence total employment and labour productivity.

In table 3 we present the results of our model estimations of the impact of exports on total employment growth. Again, from the general sample it is possible to verify that increased exports in all the three main sectors do not affect total employment in the targeted countries, as predicted in the previous economic literature. In addition, the results of the GMM estimation are consistent with the previous findings also concerning the impact of increased domestic output. Growth in the domestic output for the internal market seems to increase the overall level of employment in these countries, both in the case of increased industrial output or of higher level of agricultural and commodities production. In addition, both gains in labour productivity and an increased average level of wages are consistent with the previous results, significantly reducing the general level of total employment in these countries.

Table 4: The relationship between sectoral exports and total employment (dynamic GMM approach)

Tot. Employment	***General***	***Manufacturing-led***	***Commodity-led***
Agri. Export	0.0282	0.142***	0.0349**
	(0.0251)	(0.0148)	(0.0161)
Manuf. Export	0.00443	0.202***	0.00585
	(0.0178)	(0.0214)	(0.0132)
Commod. Export	-0.00285	0.00678	0.000967
	(0.0102)	(0.0284)	(0.0115)
Lab. Productivity	-0.797***	-0.751***	-0.923***
	(0.0530)	(0.0223)	(0.0519)
Wages	-0.252***	-0.0690***	-0.181***
	(0.0467)	(0.0206)	(0.0478)
Agri. Domestic	0.121***	0.359***	0.106**
	(0.0315)	(0.0260)	(0.0454)
Manuf. Domestic	0.0767***	0.124***	0.208***
	(0.0141)	(0.00406)	(0.0488)
Comm. Domestic	0.0714***	0.0195***	0.0634**
	(0.0143)	(0.00360)	(0.0265)
Observations	244	137	107
No. of Countries	23	10	13

In the following two columns we report the GMM estimations of the impact of increased exports on the total employment of countries characterised by manufacturing or commodities exports. First of all, it is possible to notice that in both cases domestic output still plays a key role in increasing the level of total employment. In addition, as previously discussed, gains in labour productivity and higher wages negatively affect the level of labour force employed, both in countries driven by exports of manufacturing and in the group of economies commodities-led. Finally, after instrumenting the possible endogenous variables with their previous observations, it is possible to notice that both the exports of manufacturing products and the exports of agricultural goods seem to increase the level of total employment in countries which have experienced high economic growth episodes characterised by manufacturing exports. Looking at the subsample of countries with an economic growth characterised by exports of commodities, it is possible to notice that only an increase in exports of agricultural products has a positive and statistically significant impact on the level of employment. This evidence is supported by the previous economic literature indicating how just the agricultural sector in developing countries usually employs large share of the labour force, not only for the production of output oriented to the domestic market, but also for the satisfaction of foreign demand.

Finally, table 4 presents the results of the GMM estimation of the impact of increased exports on the average level of labour productivity gains. First of all, it is possible to notice that the results from the general sample are consistent with the previous findings. Apparently, as previously demonstrated, only increased manufacturing exports seem to play a role in improving labour productivity in the targeted countries which instead is not significantly affected by other kind of exports or by an increased production for the domestic market.

Table 5: The relationship between sectoral exports and labour productivity (dynamic GMM approach)

Lab. Productivity	***General***	***Manufacturing-led***	***Commodity-led***
Agri. Export	-0.0851	-0.675	0.212
	(0.166)	(0.555)	(0.251)
Manuf. Export	0.276**	0.343**	-0.263
	(0.121)	(0.137)	(0.564)
Commod. Export	-0.0940	-0.00283	-0.0688
	(0.0713)	(0.297)	(0.0954)
Employment	-0.0525	-0.0339	-0.0512
	(0.0327)	(0.0783)	(0.0347)
Agri. Domestic	0.0985	-0.440	0.292
	(0.210)	(0.470)	(0.389)
Manuf. Domestic	0.0556	0.0732	0.0409
	(0.0860)	(0.119)	(0.230)
Comm. Domestic	-0.0153	-0.0196	-0.581
	(0.100)	(0.0947)	(0.493)
Observations	244	137	107
No. of Countries	23	10	13

We differentiate our population of countries into two subsamples, distinguishing between economies driven by manufacturing or by commodities exports. Our previous results are here confirmed. First of all, it is possible to notice that in the case of manufacturing-led economies, an increase in manufacturing exports improves as well the level of labour productivity. As previously discussed, this might happen when the so called “learning-by-exporting” phenomenon takes place, with a transfer of technology, innovative process and productive skills from international markets to the exporting country which improve labour productivity not only in the original sector. On the contrary, increased exports do not seem to have a similar impact on labour productivity in countries with an economic growth characterised by the exports of agricultural products and other extractive commodities, case in which none of the control variables appear to be statistically significant in explaining productivity improvements.

3 Conclusions

In this study we carried out an analysis of the employment and labour productivity growths in those countries which have made a quick LIC-MIC transition thanks to high economic growth periods characterised by exports of manufacturing or agricultural and extractive goods.

After reviewing the previous economic theories and the empirical predictions we used employment, trade and industrial statistics at the country-sector level to estimate the effect of export-led growth on employment and labour productivity with a dynamic model of sectoral trade and industrial output distribution. In this way, we have been able to identify in each subsample of countries the domestic and exporting sectors which have affected the employment growth and the productivity gains at the national level.

In line with previous empirical and theoretical studies, we found that both in the case of economies characterised by manufacturing exports or by exports of natural resources, most of the employment growth has been affected by the expansion of the domestic demand, mostly satisfied by the increase of the internal industrial output. The exporting sectors have contributed to the increase of total employment only partially in these countries, mainly the agricultural sector in the commodities-led group and the manufacturing exports in the industrial-led sample respectively. As predicted by the economic literature, labour productivity instead seems to be mainly related with the leading exporting sectors, especially of manufacturing goods, finding evidence of “learning-by-exporting” phenomena.

Taken together, these results show clearly that despite increased volumes of export might have affected high economic growth periods in developing countries, this export growth did not translate into increased levels of employment, but at least might have helped these developing countries to catch-up technologically and productivity-wise with more advanced and developed countries gaining from international competition new technologies, innovative processes and productive skills.

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