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La caída de la participación del ingreso laboral en México, 1990-2015

Carlos A. Ibarra (UDLAP)
Jaime Ros (UNAM)

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The decline of the labor income share in Mexico, 1990–2015

Carlos A. Ibarra[1,*] Jaime Ros[2]

[1] Departamento de Economía, Universidad de las Américas Puebla (UDLAP), Mexico; [2] Facultad de Economía, Universidad Nacional Autónoma de México (UNAM), Mexico; *corresponding author: carlos.ibarra@udlap.mx.

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Abstract: This paper studies the decline of the labor income share (*LIS*) in Mexico during the period 1990–2015. This decline is mostly explained by reductions within the economy's major sectors (including manufacturing, tradables, and non-tradables) rather than by a recomposition of value added towards sectors with low labor shares. In contrast to agriculture —where *LIS* fell due a shift of labor force from self-employment to wage-employment— in other major areas of the economy the fall in *LIS* is explained by reductions within the wage-employment sector. Econometric estimations indicate that parallel declines in the wage share and relative productivity of non-tradables and in the US manufacturing labor share all played a large role in the reduction of the manufacturing wage share in Mexico. More generally, the analysis suggests that the lagging productivity of the economy's informal non-tradable sector —itself a reflection of the country's low aggregate rate of economic growth— is a crucial factor in the fall of *LIS* in the formal sectors. The paper concludes by discussing possible explanations for the paradox of the slow rate of economic growth in Mexico despite the rise in the profit share.
Keywords: wage share, labor income share, shift–share analysis, tradable and non-tradable sectors, manufacturing, Mexico
JEL classification: E24, E25, E26, J21, J31, O11

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1. Introduction

Like many other developed and emerging countries, Mexico has featured for more than three decades a long-term decline of the labor income share. The wage share in total income fell from about 40 per cent in the mid-1970s to around 28 per cent in 2015. It fell gradually in the second half of the 1970s and then rapidly and deeply during the debt crisis and adjustment process of the 1980s. With ups and downs —an increase in the early 1990s, a fall during the 1994–95 crisis, and a recovery in the second half of the 1990s— the wage share returned in the early 2000s to its level at the beginning of the 1990s and then resumed a gradual decline since 2003. As we shall see, the labor income share, which includes both wages and the labor earnings of the self-employed, appears to have followed a similar trend since the mid-1990s.

This paper examines the evolution of the wage and labor income shares in total income in Mexico during the periods 1990–2015 (wage share) and 1995–2015 (labor income share), distinguishing between what has happened in the whole economy, the private business sector, and key areas of economic activity. Particular attention is given to the distinction between the tradable sector (particularly manufacturing, where the decline in the labor share is most noticeable) and the non-tradable sector (where self-employment incomes are especially important). Besides documenting what has happened using alternative measures of the labor income share, the paper focuses on the following questions: How do labor share trends relate to different mechanisms of price and mark-up determination in various sectors as well as to different determinants of wages and other labor incomes? How have productivity trends affected the evolution of labor shares? And why has the economy, and particularly the tradable goods sector, continued since the early 2000s on a low-growth path despite the rising profit share?

In order to address these issues, we combine data from three sources: the INEGI[1]–KLEMS dataset, and Mexico's National Accounts and employment surveys. For the period 1990–2015, the former two sources provide information on wages, employment, value added, intermediate consumption, and capital stocks for a large set of sectors at two and three digits in the National Accounts classification. The National Employment Survey (ENE) and National Survey of Occupation and Employment (ENOE) provide the necessary information to adjust the wage share to obtain the labor income share for the period 1995–2015. Making mutually consistent the National Accounts and employment surveys for 17 sectors of the whole economy

[1] INEGI: Mexico's National Institute of Statistics.

and 11 activities of the private business sector, we are able to carry out a more disaggregated analysis than previously attempted, allowing us to identify the role of inter-sectoral and intra-sectoral changes in the evolution of the labor income share.

The distribution of factor incomes in Mexico has been a neglected topic for quite some time. Previous studies are scarce and have mainly focused on the evolution of the wage share using National Accounts information. Hernández Laos (2000) examines the evolution of the wage share in non-agricultural gross domestic product for the period 1950–95, showing a rising trend from 1950 to the mid-1970s followed by a sharp decline until the late 1980s, an increase until 1994, and another sharp drop during the 1995 crisis. Samaniego (2014) calculates for the whole economy the wage share from 1970 to 2012, and the labor income share from the late 1980s to 2012 based on the National Accounts estimates of mixed incomes. For the period 2003–12, Samaniego (2014) adjusts the wage share either assuming that 75 per cent of mixed income is labor income, or alternatively applying the Gollin procedure of equating labor income of the self-employed to the income of wage earners.

Recent studies have shown that the marked fall in the labor share in Mexico since the early 2000s contrasts with the experience of countries like Argentina, Brazil, or Chile—which had higher and more stable labor shares during the 2000s (see Abeles et al. 2014)—and with the group of emerging market and developing countries as a whole—where the labor share fell in the early 2000s but then recovered (see International Monetary Fund 2017). Focusing on the evolution of the wage share in total income in Mexico during the period 2003–13, Ros (2015) finds that the fall in the wage share is due to an acute reduction of this share in the tradable goods sector, particularly manufacturing, and not to the performance in the non-tradable goods sector where the wage share remained approximately constant. This contrast is attributed to differences between sectors in price formation mechanisms together with contrasting labor productivity trends (fast growth in the tradable sector and stagnation, with few exceptions, in the non-tradable sector). López and Malagamba-Morán (2016) study the evolution of the wage share in manufacturing value added during the period 1994–2009, and show that the fall observed since the early 2000s had as counterpart a rise in the gross profit margin. In econometric estimations for a panel of manufacturing industries, they find that among other variables the profit margin is positively correlated with the real exchange rate (the inverse of the real value of the peso) and the share of manufacturing exports in output.

As explained above, the present paper departs from previous studies in the use of a wider set of sources and a more disaggregated analysis. It shows that labor shares faced a long-term decline in both the tradable and non-tradable sectors, larger for the tradable sector —especially manufacturing— in the case of wage share and similar in the case of labor income share. Intra-industry changes rather than compositional changes account for the fall in the labor shares. Within each industry, the wage share in the wage-employment subsector has in turn been the main driver of the evolution of sectoral labor income shares (with agriculture being a main exception, as explained below).

The fall in the aggregate labor income share over the past two decades is associated with several major trends. A first one is the decline in the labor income share in agriculture, a result of the reallocation of labor force from self-employment to wage employment, in the context of a wide and increasing productivity differential in favor of the wage-employment subsector. A second trend is the acute fall in the wage share in manufacturing (overall and in the wage-employment subsector) determined, according to econometric estimates, by the fall in the wage share and relative productivity in the non-tradable sector together with the decline of the US manufacturing labor share.

The third trend is a decline of the wage share in the wage-employment subsector of non-tradable activities, associated to the steady increase (especially after 2001) in the productivity differential between the modern and informal non-tradable subsectors. The rising productivity differential is in turn the result of an increasing productivity level in wage employment, together with stagnant productivity in self-employment. Taken together, these trends imply that a major factor behind the fall in the wage shares in the formal subsectors of the economy has been the poor performance of labor productivity in the informal ones.

Following this introduction, the paper is divided into four sections. The second section describes the methodology and discusses the data sources and problems faced in constructing alternative estimates of the labor shares. It also presents these estimates for the whole economy, the private business sector, and key areas of economic activity. The third section presents a shift–share analysis for the private business sector and manufacturing that disentangles the role of inter-sectoral and intra-sectoral change in the evolution of labor shares. The fourth section looks at the determinants of the labor income shares and offers an explanation of the stylized facts by looking at the mechanisms of price and mark-up determination and the determinants of wages in different sectors of the economy. The fifth section concludes by assessing future work in terms of deepening our understanding of the evolution of the labor income shares. In particular, it highlights the paradox—which is key to understanding the persistence of the fall in the labor share—of why the economy, and particularly the tradable goods sector, has continued since the early 2000s on a low growth path despite the rising profit share. An online appendix explains measurement issues, provides supplementary tables and figures, and develops the paper's analytical framework.

2. Evolution of the labor income share in Mexico

2.1 Methodology

The relationship between the labor income share (*LIS*) and the wage share in value added ($WS = W/VA$) in a given sector can be shown as:[2]

(1) $$LIS = [(1-a) + a\, L/L_w]WS = (1 + a\, L_s/L_w)WS$$

where W represents the nominal wage bill in the National Accounts (which includes the earnings of subordinated workers), VA represents the nominal value added in the National Accounts, L represents total employment in ENE and ENOE (after subtracting employers and non-remunerated workers), L_w represents employment of subordinated workers in ENE and ENOE, L_s represents self-employed (*cuenta propia*) in ENE and ENOE, L_w/L represents the wage-employment ratio, and a represents the ratio of labor earnings per hour of the self-employed to earnings per hour of subordinated workers.

Two methods were followed to obtain the labor income share per sector:

2.1.1 Method 1 (*LIS1*): $a = 1$

This method assumes that labor earnings of the self-employed in a given sector are equal to earnings of subordinated workers. In this case, $a = 1$ and the expression above reduces to

[2] This expression is obtained as follows: $LIS = [wL_w + aw(L - L_w)]/VA = [(1 - a)wL_w + awL]/VA = (1 - a)W/VA + awL/VA = (1 - a)W/VA + awL_wL/VAL_w = (1 - a)W/VA + a(W/VA)(L/L_w) = [(1 - a) + aL/L_w]W/VA$, where w is earnings per hour of subordinated workers.

$LIS = (L/L_w)\ WS = (1 + L_s/L_w)\ WS$. Adjusting for differences between subordinated workers and self-employed in hours worked implied multiplying L_s/L_w by the ratio *b*, equal to hours worked per employee in the self-employment sector to hours worked per employee among subordinated workers.

2.1.2 Method 2 (*LIS2*)

This method attributes all the earnings of the self-employed to the contribution of labor. In this case, *a* is the ratio of earnings per hour of the self-employed to earnings per hour of subordinated workers in the same sector, which can be obtained from ENE and ENOE. Again, adjusting for differences in hours worked implies multiplying L_s/L_w by the ratio *b*.

We also obtained an alternative measure of *LIS2*, which we call *LIS3*. In this measure, available only for 2005–14, we imputed missing labor earnings in order to adjust for the apparently increasing underreporting of labor incomes in ENOE. For this, we used the hot-deck imputation procedure described by Campos-Vázquez (2013), which takes into account gender, age, education, and location groups to impute earnings to workers that do not answer the labor earnings question. This led to an alternative estimate of ratio *a* that we used in estimating *LIS3*.[3] As it turned out, *LIS3* showed a similar behavior both in trend and short-term fluctuations to that of *LIS2* and thus it is not shown here but can be consulted in the online appendix to this paper.

Sectoral information is directly available from ENOE for 11 sectors and can also be constructed at a more disaggregated level for 17 sectors based on the North American Industry Classification System (NAICS). We opted for this more disaggregated classification that involved homologating the information of the National Accounts with that of ENOE for the period 2005–15, and with that of ENE for 1995–2004, on the basis of NAICS (see online appendix for details). The aggregate labor income share is obtained by adding up the labor incomes ($LI = LIS \times VA$) of all relevant sectors and estimating its share in total value added.

We estimated two aggregate labor income shares. One refers to the economy as a whole and the second, which will be our main focus, refers to what may be loosely called the private

[3] We are very grateful to Luis Monroy Gomez-Franco for providing us with the estimate of ratio *a* by sector using the hot-deck imputation procedure.

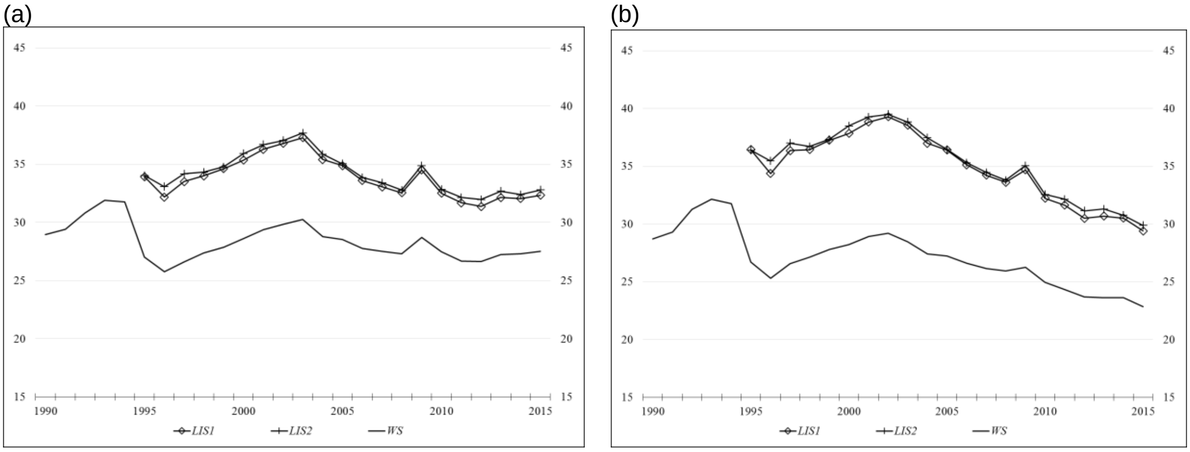
business sector, which includes 11 activities and excludes a number of sectors from the whole economy. The main adjustments involved the exclusion of (i) real-estate services, where value added is largely reported as capital income and results from the imputation of owner-occupied housing in the National Accounts; (ii) public administration and social services, which are mostly provided by the public sector, where value added, as measured in the National Accounts, is almost equal to the sum of labor costs; and (iii) mining, electricity, and oil and coal derivatives (sector 324 in the National Accounts), which are also largely dominated by the public sector and public sector industries and services (see online appendix for details).

2.2 Aggregate wage and labor income shares

Figure 1 shows the wage share since 1990 and the labor income shares *LIS1* and *LIS2* since 1995 for the whole economy and the private business sector. *LIS1* and *LIS2* behave very similarly in their levels, trends, and fluctuations, suggesting that in the aggregate self-employment earnings per hour are very similar to earnings of subordinated workers.[4] All the alternative measures recorded a downward trend during the periods covered. In the private business sector, the wage share fell from 28.7 per cent in 1990 to 22.8 per cent in 2015, after reaching a peak of 31.8 per cent in 1994. *LIS1* fell from 36.4 per cent in 1995 to 29.4 per cent in 2015, a larger 7 percentage point drop, with *LIS2* falling by a similar amount.

Figure 1: Wage and labor income shares, 1990–2015: (a) whole economy; (b) private business sector

(a) (b)



Source: Authors' calculation based on data from INEGI. See Equation (1) and online appendix for details.

[4] As can be seen in Figures 2 and 3 below, self-employment earnings are inferior to wages in the tradable sector (particularly in agriculture, shown in the online appendix) as *LIS2* is less than *LIS1*, whereas the opposite happens in the non-tradable sector.

As shown in the figure, the wage share in the private business sector follows very closely that of the whole economy, although with a more marked downward trend. The similarity is due to the fact that some of the sectors excluded to estimate the wage share in the private business sector (oil and real estate) have very low wage shares whereas others (social and government services) have very high wage shares, thus compensating the absence of the former.

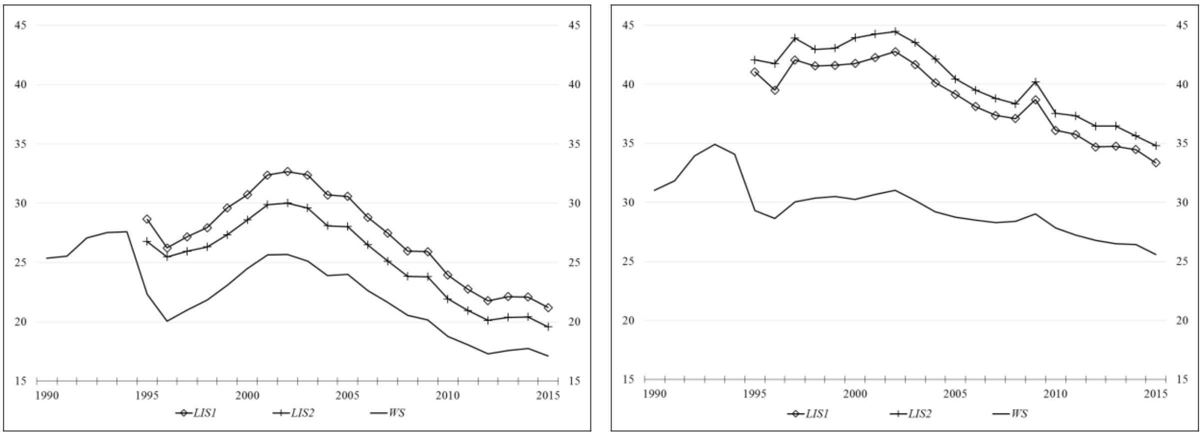
LIS1 and *LIS2* in the private business sector also follow closely that in the whole economy, although initially at a higher level. This is because self-employment income is relatively unimportant in the sectors excluded when estimating the labor shares in the private business sector. At the end of the period, the labor income share of the whole economy turns out to be higher than that of the business sector, which is consistent with the gap in the wage share that opens up from 2001 onwards in favor of the whole economy. This implies that the downward trend of the labor income share is more marked in the business sector than in the whole economy, similar to what happens for the wage share.

2.3 Tradables and non-tradables in the private business sector

Similarly to what is observed in the aggregate, the labor share in the tradable and non-tradable sectors faced a long-term decline, although the role of wages and self-employment incomes in accounting for the decline differs in the two sectors. Between 1990 and 2015, the wage share declined by more in tradables (8.3 percentage points) than non-tradables (5.4 points). The labor share, in contrast, shows a similar decline (of more than 7 points during 1995–2015) in both sectors (see Figure 2). In turn, the fall in the labor share in the tradable sector is mainly determined by what happens in manufacturing, where the wage share recorded an 11.4 percentage point drop from 1990 to 2015 and *LIS1* a 6.7 percentage point fall from 1995 to 2015 (and an 11.9 point drop from its peak in 2002 to 2015). In agriculture, by contrast, the wage share is relatively stable at around 16 per cent from 1990 to 2015, whereas the drop (of the order of 8 percentage points) in the labor income share is driven by the increase in the wage employment ratio (more on this below; see Figure 3).

Figure 2: Wage and labor income shares in the (a) tradable and (b) non-tradable sectors, 1990–2015

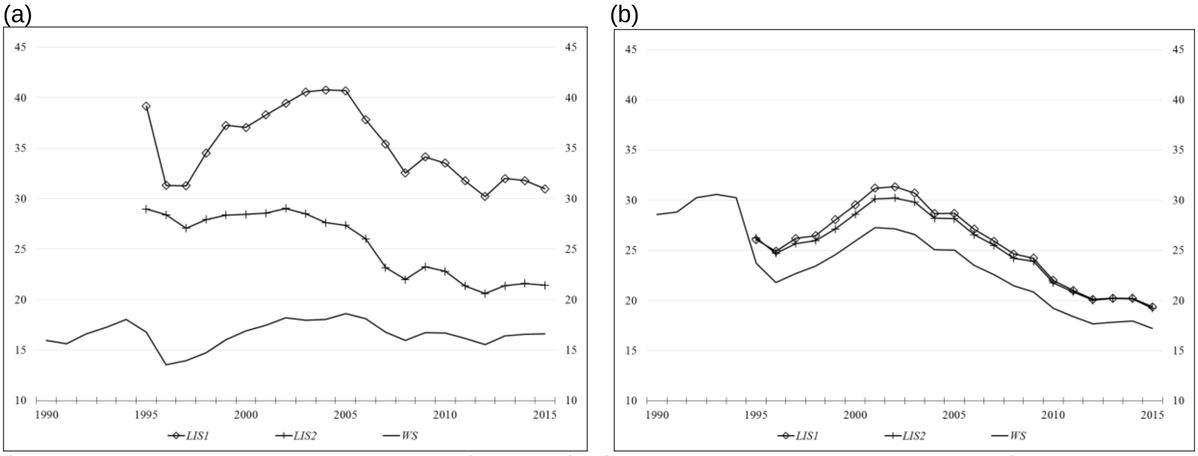
(a) (b)



Source: Authors' calculation based on data from INEGI. See Equation (1) and online appendix for details.

Figure 3: Wage and labor income shares, 1990–2015: (a) agriculture; (b) manufacturing

(a) (b)



Source: Authors' calculation based on data from INEGI. See Equation (1) and online appendix for details.

In the non-tradable sector, we find two main different patterns. First, the bulk of the non-tradable sector features relatively stable or moderate declines in wage shares and slightly larger falls in labor income shares. This is the case of the largest sectors, namely, construction and commerce (although commerce shows significant fluctuations), together with transport and warehousing, accommodation and food services, and other services (all these series can be consulted in the online appendix). In these sectors, self-employment income, declining as percentage of value added throughout the period, represented (measured by method 2) around 10 per cent of value added in construction, commerce, and accommodation and food services, 8 per cent in transportation and warehousing, and 13 per cent in other services at the end of the period. These sectors, in particular commerce and construction, account for the overall pattern of moderate reductions in wage shares together with larger declines in the labor income shares. Second, sectors with very small presence of self-employment —information, and finance and insurance— recorded drops in the wage and labor shares, very sharp in the first sector (similar to manufacturing) and very moderate in the second one. Large drops in the wage and labor shares also took place in professional, scientific, and technical services and, less sharply, in arts, entertainment, and recreation.

3. The role of compositional and intra-sectoral changes

3.1 Analysis for the private business sector

The shift–share methodology allows us to decompose the change in a given variable into the contributions of changes of that variable within sectors and changes in sectoral composition. In the case of the labor share, a shift–share decomposition would be:

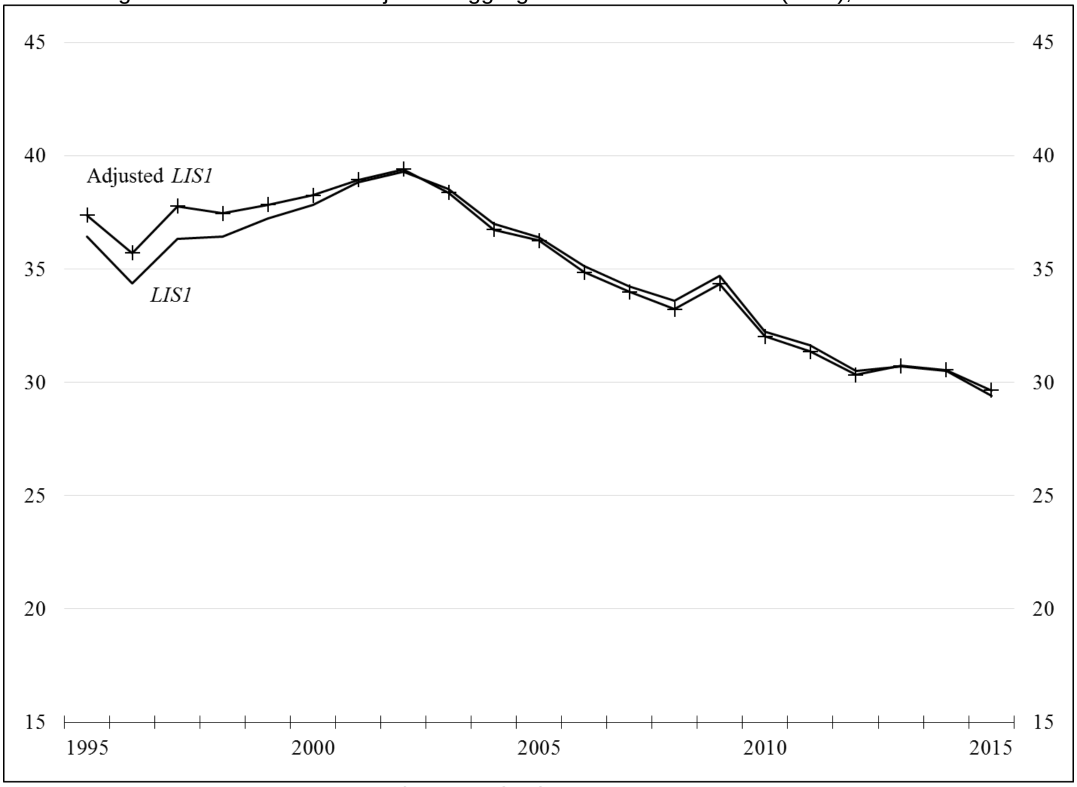
$$(2) \qquad LIS_t - LIS_{t-1} = \Sigma\, va_i\sim(lis_{it} - lis_{it-1}) + \Sigma\,(va_{it} - va_{it-1})lis_i\sim$$

where *LIS* and *lis* refer to the aggregate and sector labor income shares, respectively, va_i is the share of sector *i* in nominal value added, and a tilde represents averages between the start and end dates (see de Serres et al. 2002; OECD 2012). The first term on the right-hand side is the weighted sum of the change in wage shares within sectors, i.e. a weighted average of *within-industry* changes in the labor income share (the shift component). The second term represents the effect of the change in the weights of each sector, i.e. the contribution of sectoral reallocation across industries with different labor shares (the share or *between-industry* component, or compositional effect).

The effect of compositional changes and intra-industry changes in the labor income share can be gauged by comparing the observed labor income share with an alternative aggregate measure obtained by keeping constant the sectoral weights at their average value. This adjusted labor income share is thus estimated year by year as $ALIS = \sum va_i \sim lis_i$, where $va_i \sim$ is the average value of the share of sector *i* in nominal value added during the whole period.

Figure 4 shows the observed and adjusted values for *LIS1* for the period 1995–2015, using the sectoral disaggregation presented in Table 1. As can be seen, the adjusted labor share replicates very closely the evolution of the observed labor share, suggesting that the between-industry component, due to compositional change, has been relatively unimportant. The same conclusion applies to *LIS2* (not shown here). The result can be explained by a relatively stable industry structure together with the fact that the process of resource reallocation has taken place not between sectors with high and low labor shares but rather among sectors with a relatively high labor income share. More precisely, reallocation has taken place from agriculture, manufacturing, accommodation and food services, and other services towards construction, commerce, transportation and warehousing, and professional, scientific, and technical services. Most, although by no means all, of these sectors feature higher than average labor income shares at the start and end of the period.

Figure 4: Observed and adjusted aggregate labor income share (*LIS1*), 1995–2015



Source: Authors' calculation based on data from INEGI. See Equation (2) and online appendix for details.

Table 1: Sectoral shares in value added and labor income shares (private business sector)

	Share in value added (%)		*LIS1* (%)		*LIS2* (%)	
	1995	2015	1995	2015	1995	2015
Agriculture	7.3	5.1	39.2	31.0	29.0	21.4
Manufacturing	29.8	27.3	26.1	19.4	26.2	19.2
Construction	9.5	11.6	53.7	49.9	58.6	51.7
Commerce	23.8	26.5	36.4	24.5	32.4	25.4
Transportation and warehousing	8.7	9.9	40.1	36.5	45.3	37.7
Information	3.0	3.2	33.7	25.3	33.9	25.2
Finance and insurance	6.1	5.5	31.5	27.4	31.5	27.7
Professional, scientific, and technical services	2.4	3.5	63.9	42.0	72.8	47.8
Arts, entertainment, and recreation	1.0	0.7	37.5	30.3	39.5	34.1

Accommodation and food services	4.3	3.6	37.9	30.3	41.0	32.5
Other services	4.0	3.2	51.0	49.5	58.7	52.5
Total	100.0	100.0	36.4	29.4	36.4	29.9

Source: Authors' calculation based on data from INEGI. See Equation (1) and online appendix for details.

A shift-share analysis of the wage share in manufacturing shows also that for the whole period 1990-2015, the shift component is by far the largest one, accounting for 9.9 points of the total fall of 11.3 points in the wage share and reflecting a widespread decline in the wage share across industries. For the analysis, the manufacturing sector was disaggregated into 20 industries at the three-digit level,[5] and calculations were carried out for the whole 1990–2015 period and its two main phases, 1990-2002 and 2002-15. Table 2 presents the results.

Table 2: Shift–share analysis for the manufacturing wage share, 1990–2015

Period	(1) Wage share in initial year (%)	(2) Cumulative change in the wage share (percentage points)	(3) Shift component	(4) Share component	(5) Covariance term	(6) Total[a]
1990–2015	28.6	–11.3	–9.9	0.4	–1.8	–11.3
1990–2002	28.6	–1.4	–0.2	0.0	–1.2	–1.4
2002–15	27.2	–9.9	–9.2	–0.2	–0.5	–9.9

Notes: Decomposition uses the formula: $\Delta WS = \Sigma_j va_{j0} \Delta ws_j + \Sigma_j ws_{j0} \Delta va_j + \Sigma_j \Delta ws_j \Delta va_j$, where Δ indicates the change during the period, ws_j is the wage share in manufacturing industry *j*, and va_j is the share of industry *j* in nominal manufacturing value added, and where now the formula uses the initial values of the variables instead of their averages as weights (see Elsby et al. 2013). The first two terms on the right-hand side measure the change in the manufacturing wage share due to changes in the wage share within each manufacturing industry (the shift effect) and the composition of value added by industry (the share effect). The third term, a covariance component, captures the joint effect of changes in the wage share within industries and in the industry composition of value added; this term will be negative if, for example, the wage share falls in industries whose contribution to manufacturing value added is rising.
[a]Equal to the horizontal sum of columns (3) to (5) and to the sum of the individual total across the 20 manufacturing industries (not shown).
Source: Authors' calculations based on data from INEGI–KLEMS. See equation above.

3.2 Intra-sectoral change in the labor income share

Given that the within-industry factor is the main component behind the fall in the aggregate labor income share, we now investigate the proximate determinants of the fall in the labor income share within each economic activity. For this, we can think of each industry as consisting

[5] As noted in the Introduction, subsector 324 (oil and coal products) was excluded from the definition of the manufacturing sector.

of a wage-employment subsector and a self-employment one (see the model in the online appendix). The labor income share can then be decomposed as follows:[6]

(4) $$LIS = 1 - (1 - AWS)(L_w/L)(p_w/p)$$

where AWS is the wage share within the wage-employment subsector (W/VA_w, what we call the adjusted wage share), L_w/L is the share of subordinated workers in total employment (or wage-employment ratio), and p_w/p is the ratio of productivity in wage employment (p_w) to average sector labor productivity (p). Since AWS is less than 1, increases in L_w/L and p_w/p tend to reduce LIS, as they imply an increase in the relative size of wage employment.

Thus, the change in the labor income share can be seen as a result of three forces. First, a change in the wage share within the wage-employment subsector, which has to be attributed to the fact that the product wage there grew at a different pace than did labor productivity. Second, a change in the wage-employment ratio, resulting from a reallocation of labor force between self-employment and wage employment within the industry, which to the extent that the labor share is lower in the wage-employment subsector than in self-employment will result in a change in the sector's overall labor income share. Third, given the wage share in the wage-employment subsector and the wage-employment ratio, a change in the productivity differential between the two subsectors will also affect the labor income share. A lower productivity in self-employment, for example, will tend to depress self-employment income and the labor income share.

The role of these forces can be gauged by looking at the evolution of the adjusted wage share, which can be estimated as the ratio of the wage bill to value added excluding self-employment income: $AWS = W/[VA - (LI - W)]$, where as before AWS is the adjusted wage share, W the wage bill, VA the industry value added, and LI labor income (estimated from $LIS2$ so that $LI - W$ is self-employment income[7]). If, for example, the adjusted wage share in a given industry with a falling labor income share has been rather stable, it is clear that the main forces

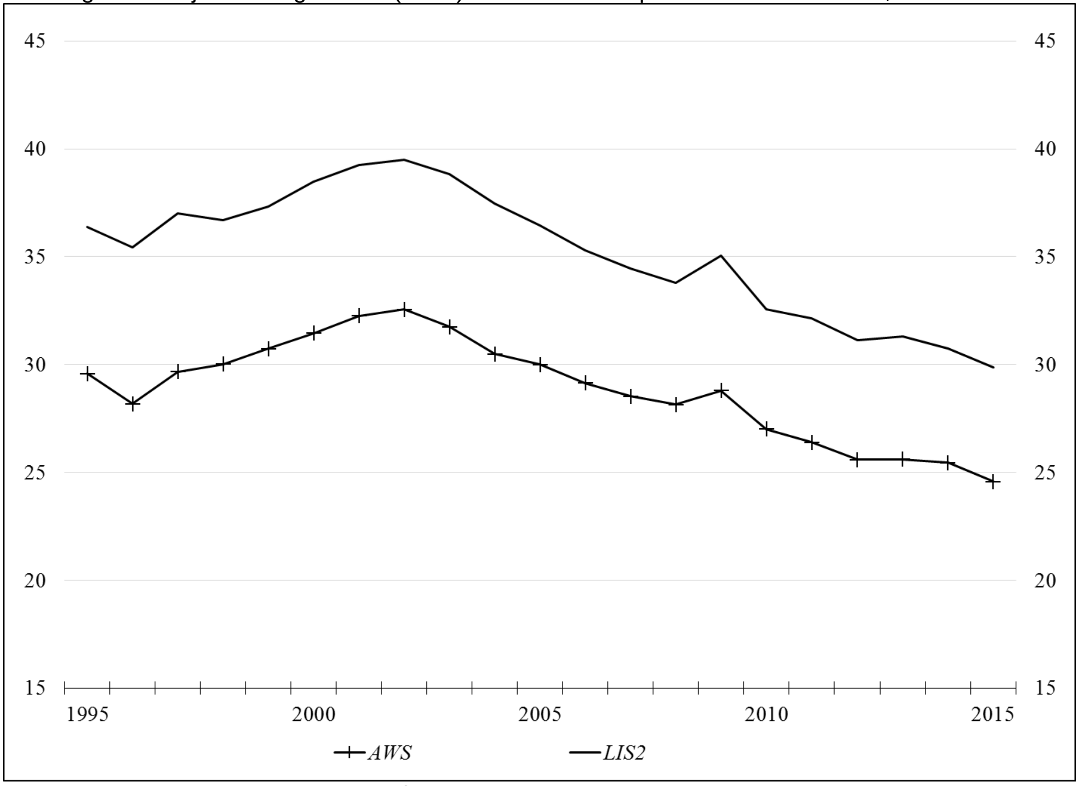
[6] The decomposition, which assumes that value added in the self-employment sector consists entirely of labor income, is obtained as follows: $LIS = (1 - VA_w/VA) + (W/VA_w)(VA_w/VA) = 1 + (AWS - 1) VA_w/VA = 1 - (1 - AWS)(p_w/p)(L_w/L)$, where VA_w is value added in the wage-employment sector.

[7] In this calculation $LI - W$ must be equal to value added in self-employment, which will be the case under the assumption that the entire value added in that subsector corresponds to labor income, which is the assumption used in deriving $LIS2$.

behind the falling labor income share must be the reallocation of the labor force from self-employment into wage employment or changes in relative productivities.

Figures 5 and 6 show the adjusted wage share and *LIS2* in the private business sector, and the tradable and non-tradable sectors. The similarity in the behavior of the adjusted wage share and the labor income share suggests that overall the evolution of the adjusted wage share, rather than reallocation or relative productivity effects, has been the main force behind the decline in the labor share.

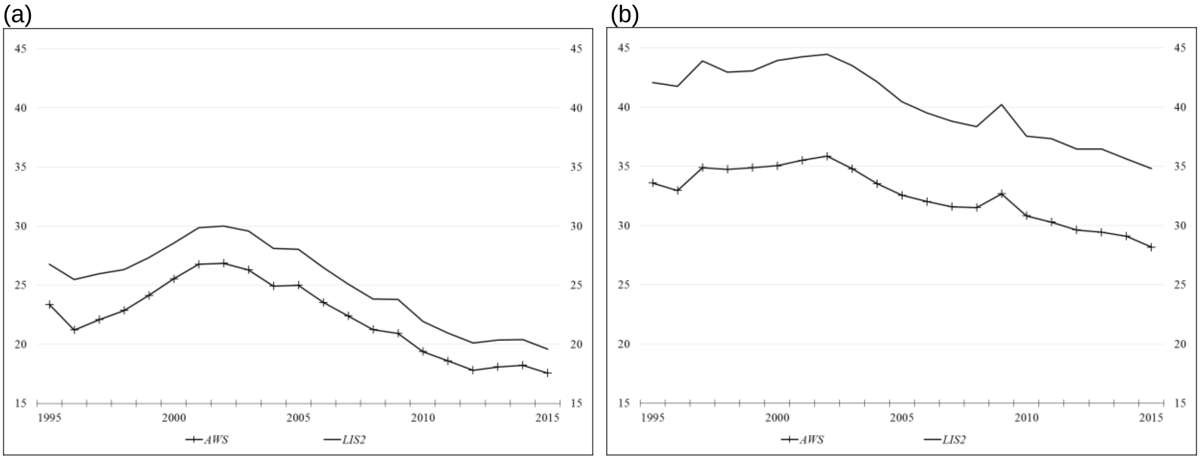
Figure 5: Adjusted wage share (*AWS*) and *LIS2* in the private business sector, 1995–2015



Source: Authors' calculation based on data from INEGI. See Equation (4) and online appendix for details.

Figure 6: *AWS* and *LIS2* in the (a) tradables and (b) non-tradables sectors, 1995–2015

(a) (b)



Source: Authors' calculation based on data from INEGI. See Equation (4) and on line appendix for details.

There are only two sectors, agriculture and commerce (see on line appendix), where the decline in the labor income share is significantly more pronounced than that of the adjusted wage share, this being especially so in agriculture, where despite a very significant fall in the labor income share the adjusted wage share remains relatively stable during the period. These two sectors are precisely those with the sharpest increases in the wage-employment ratio (see Table 3). That the sharp increase of this ratio in commerce had little effect on the gap between the adjusted wage share and the labor income share is because, contrary to what happens in agriculture, the productivity differential in favor of the wage-employment subsector declined during the period, thus restraining the fall in the labor income share (see Figure 8 below and online appendix).

Table 3: Wage-employment ratio, 1995 and 2015

Sector	1995	2015
Agriculture	0.30	0.44
Commerce	0.41	0.53
Other services	0.70	0.78
Construction	0.72	0.80
Transportation and warehousing	0.80	0.80
Accommodation and food services	0.60	0.59
Finance and insurance	0.99	0.98
Information	0.97	0.96
Manufacturing	0.85	0.82
Arts, entertainment, and recreation	0.77	0.74
Professional, scientific, and technical services	0.70	0.66
Total	0.56	0.66

Note: Ratio of subordinated workers to total employment (excluding employers) according to ENE and ENOE.
Source: Authors' calculation based on data from INEGI. See Equation (1) and online appendix for details

4 Towards an explanation: Price and wage determination in the tradable and non-tradable sectors

A conclusion from the previous section is that with the exception of agriculture, changes in the adjusted wage share —the share of wages in the wage-employment subsector— rather than reallocation or relative productivity effects, have been the main force behind the decline in the labor income share. We now search for an explanation of the evolution of the adjusted wage share in the main sectors of the economy. In the case of manufacturing we focus on the wage share (instead of the adjusted wage share) to have a longer period of analysis and given the stable and very limited presence of self-employment incomes in this sector. In the non-tradable activities, we focus on the adjusted wage share over the period 1995–2015 given the much larger proportion of self-employment in the largest non-tradable sectors (commerce in particular; see Table 3).

4.1 Non-tradable sector

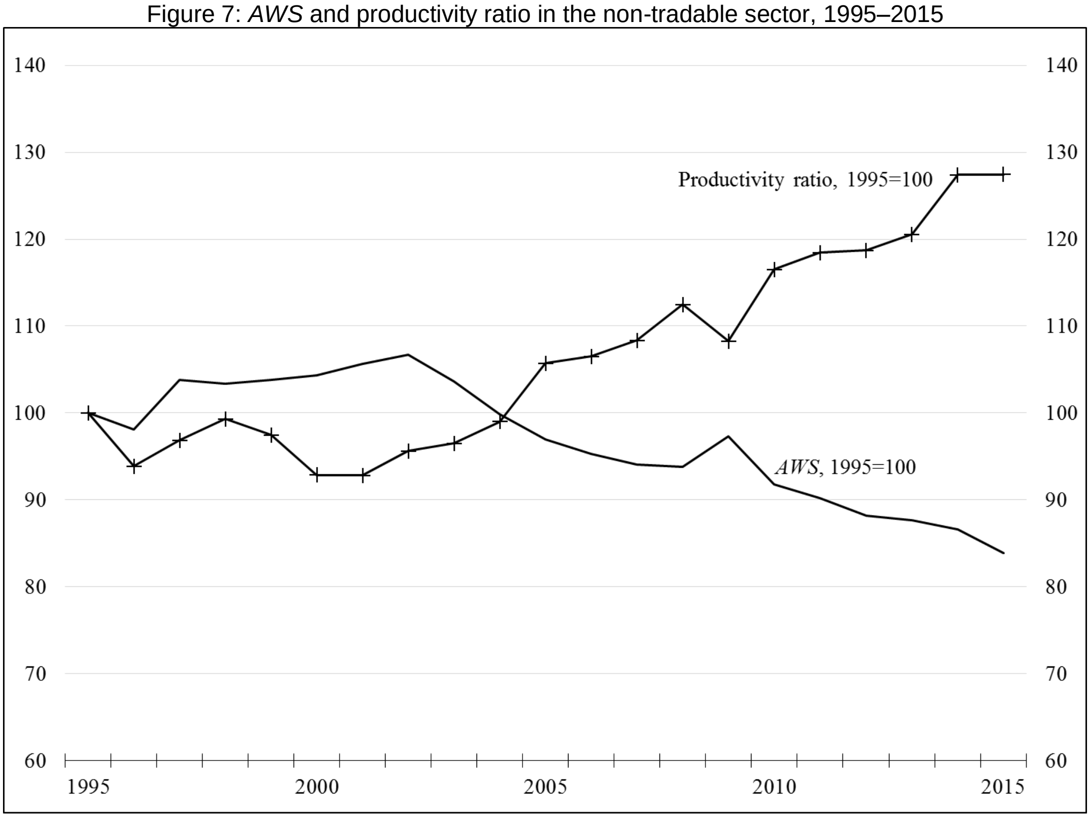
Consider an economy where in each non-tradable activity a modern or wage-employment subsector coexists with an informal or self-employment one (for details, see the model in the online appendix). The modern subsector operates under imperfect competition in the goods market, in which it also competes with the informal one. Its wage share, which is the 'adjusted wage share' of this activity estimated in Section 3, is inversely related to the mark-up set by modern firms. The key driving force affecting the mark-up and thus the adjusted wage share is the labor productivity ratio between the modern and informal subsectors. The mechanisms operating can be seen in the following two scenarios.

In the simplest case, labor earnings in the informal and modern subsectors are equalized through competition in the labor market, and the two subsectors produce very close substitutes so that prices in the modern one are subject to limit pricing. With full wage and price equalization, the mark-up in the modern subsector and the adjusted wage share of the non-tradable activity are fully determined by the productivity differential in favor of the modern subsector: a higher labor productivity there (given productivity in the informal subsector) reduces labor unit costs and increases the mark-up.

In a second scenario, informal earnings and formal wages are assumed to be related as in a Todaro-like unemployment model so that informal earnings are equal to *expected* formal wages, given by the formal wage times the probability of finding a formal job (a negative function of unemployment). Firms in the modern subsector set their mark-up as a function of their monopolistic power in the goods market and their monopsonistic power in the labor market. In this case, an increase in labor productivity in the modern subsector (given labor productivity in the informal one) increases the product wage in the modern subsector for a given mark-up. The formal wage premium increases and informal workers enter the formal labor market, thus increasing unemployment until again the wage premium stabilizes at a higher level of unemployment. The increase in unemployment allows modern firms to raise their mark-up with the result that the wage share in the modern non-tradable subsector falls.

In both cases, the key factor driving the wage share in the modern subsector is its relative productivity vis-à-vis the informal one. Figure 7 shows a clear inverse relationship in both the short and long run between the adjusted wage share of the non-tradable sector and the productivity ratio between the wage-employment and self-employment subsectors estimated from KLEMS and the INEGI employment surveys.[8] The adjusted wage share increases up to 2002 at a time when the productivity ratio is mostly decreasing, falls from 2002 to 2008 during the recovery of the productivity ratio, rises again during the recession of 2009 when the productivity ratio falls, and declines again from 2010 to 2015 mirroring the recovery of the productivity ratio.

Figure 7: *AWS* and productivity ratio in the non-tradable sector, 1995–2015



Note: Productivity ratio of wage-employment to self-employment sector.
Source: Authors' calculation based on data from INEGI. See Equation (4) and online appendix for details.

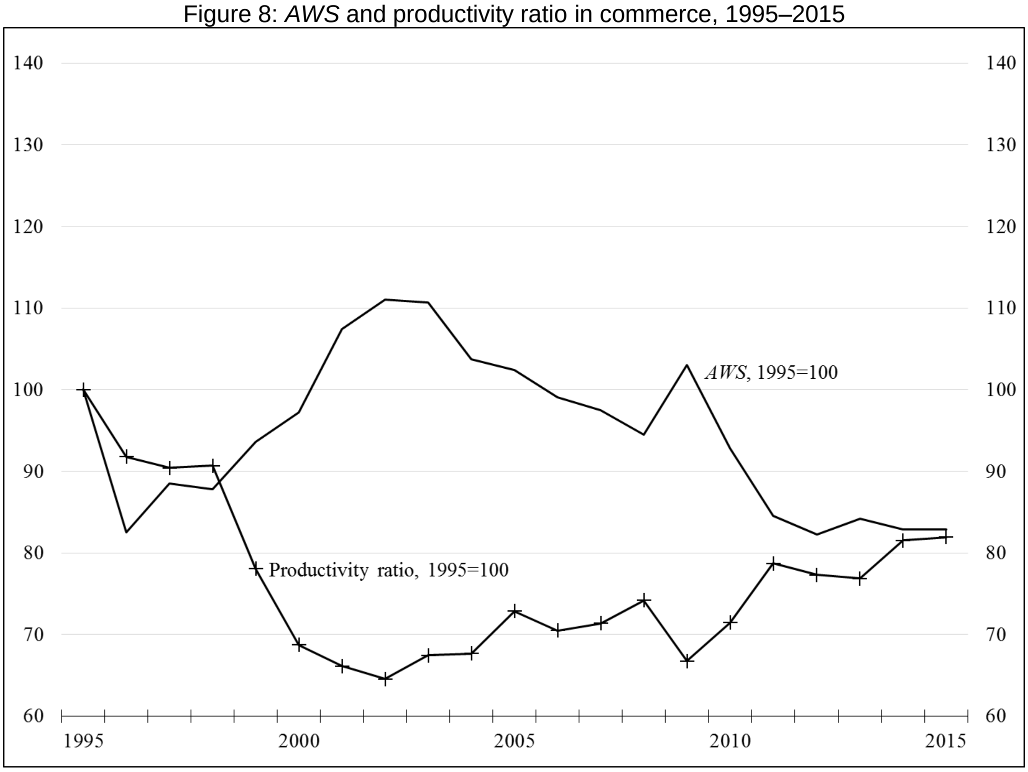
The same relationship holds individually for the non-tradable sectors with a self-employment ratio of 20 per cent or more at the end of the period (i.e. with relatively high ratios

[8] The estimation of labor productivity in the wage-employment and self-employment subsectors within each economic activity is described in the online appendix.

of self-employed and non-remunerated workers to total employment). As shown in Figure 8, the inverse relationship is particularly clear in the commerce sector, which has the highest self-employment ratio in the non-tradable sector (47 per cent in 2015; see Table 3).

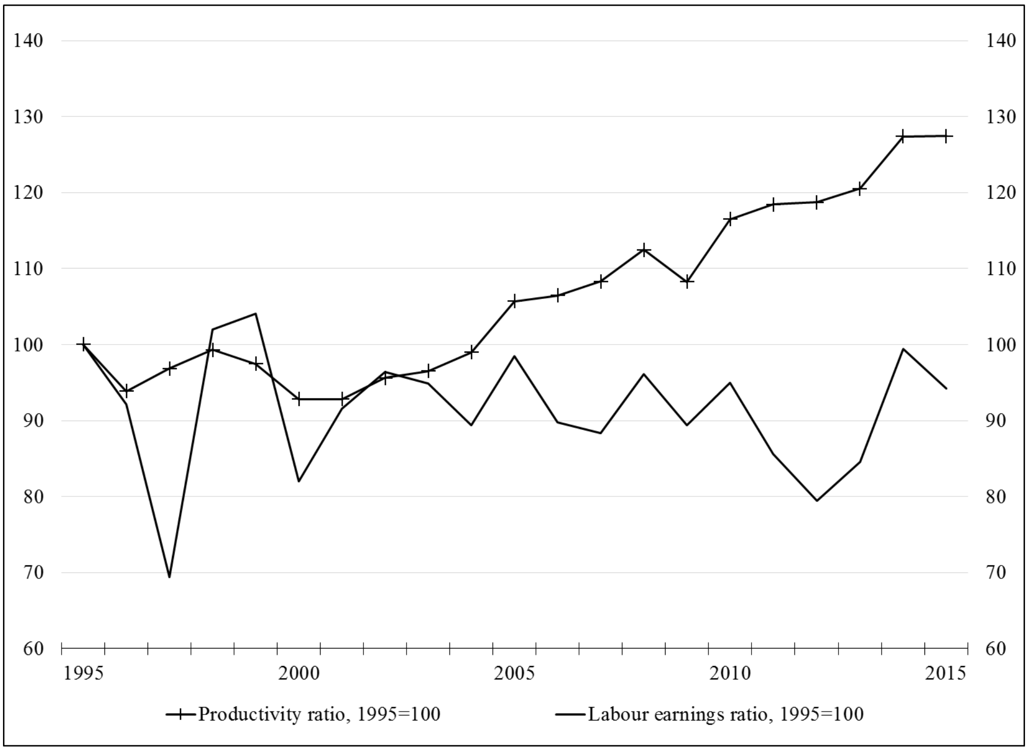
Thus, the decline of the adjusted wage share in the non-tradable sector was determined by the steady increase (especially after 2001) in the productivity differential between the modern and informal subsectors of non-tradable activities in the context of a stable aggregate earnings differential between these subsectors (see Figure 9). The rising productivity differential is in turn the result of an increasing productivity level in the wage-employment subsector, a cumulative 25 per cent increase from 1995 to 2015, together with a stagnant productivity (in fact, a cumulative decline of the order of 3 per cent) over the same period in self-employment (see Figure 10).

Figure 8: *AWS* and productivity ratio in commerce, 1995–2015



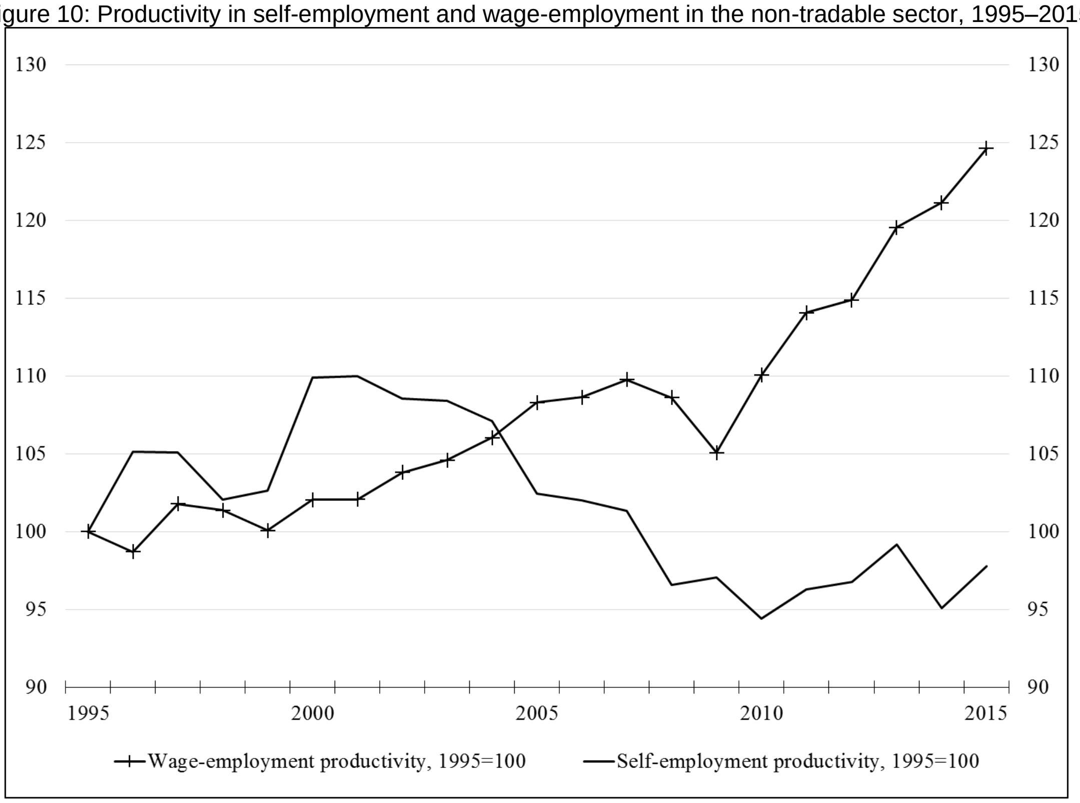
Note: Productivity ratio of wage-employment to self-employment sector.
Source: Authors' calculation based on data from INEGI. See Equation (4) and online appendix for details.

Figure 9: Productivity and earnings ratios in the non-tradable sector, 1995–2015



Note: Productivity and labor earnings ratios of wage-employment to self-employment sector.
Source: Authors' calculation based on data from INEGI. See online appendix for details.

Figure 10: Productivity in self-employment and wage-employment in the non-tradable sector, 1995–2015



Source: Authors' calculation based on data from INEGI. See online appendix for details.

4.2 Agriculture

In agriculture, we observe a decline in the labor income share in the context of a stable wage share in its wage-employment subsector. The decline is the result of a falling share of self-employment incomes caused by the reallocation of labor force towards the wage-employment subsector with a lower labor share [see Equation (4)] in the context of a wide and increasing productivity differential in favor of the wage-employment sector (see on line appendix).

4.3 Manufacturing sector

Consider a small open economy with two sectors: an imperfectly competitive non-tradable sector, where firms follow a mark-up pricing rule; and a tradable sector (here understood as manufacturing), where firms take prices as exogenously given in the world market. Assuming that no intermediate inputs are used, in the non-tradable sector the product wage will equal the ratio of labor productivity to gross mark-up: $w_N/p_N = b_N/(1 + z)$. With mobility of labor across sectors, the nominal wage in the tradable sector will tend to equal that in the non-tradable sector: $w = w_N$. Substituting from the previous equation for the product wage in non-tradables, and recalling that the wage share in tradables equals the ratio of product wage to labor productivity (b_T), we arrive at $WS_T = (b_N/b_T)/(p_T/p_N)(1 + z)$ (for details, see the model in the online appendix). This shows the wage share in tradables depends positively on the relative productivity of labor in non-tradables, and negatively on the relative price of tradables and the mark-up in non-tradables.

While the expression for wage share is an identity, under the simplifying assumptions being made the three determinants can be seen as largely (although not completely) autonomous from the manufacturing wage share and among themselves: the relative price of tradables versus non-tradables, given the influence of the exchange rate on prices of tradables, is crucially determined by monetary and exchange rate policies; the relative productivity of the non-tradable sector is affected by productivity trends in tradables and non-tradables; and the mark-up in non-tradables is affected by market structures in the goods and labor markets and the relative productivity of modern versus informal activities in the non-tradable sector.[9]

Figure 11 presents log series for the determinants of the manufacturing wage share. As shown in Figure 11a, during an early phase (1990–2002) the relative productivity of non-

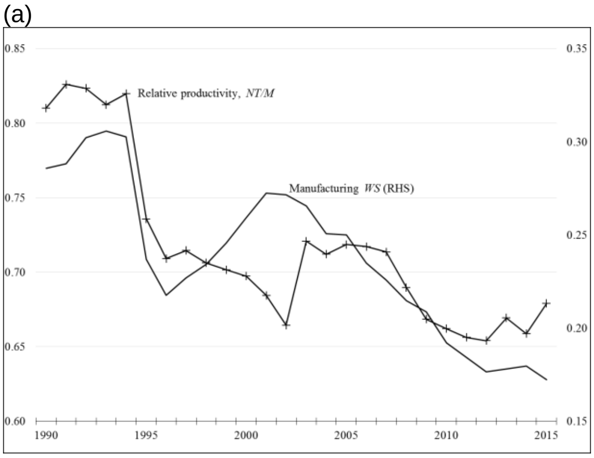
[9] To undertake an analysis for the 1990–2015 period, we take the relative productivity of non-tradables as a whole as a proxy for the relative productivity of the wage-employment subsector in non-tradables and the wage share in non-tradables as a proxy for the adjusted wage share of this sector.

tradables declined. After a partial, transitory recovery due to a discrete fall in manufacturing productivity in 2003, during a late phase (2003–15) productivity growth accelerated in non-tradables and decelerated in manufacturing (not shown here), both trends slowing the decline of relative productivity in the non-tradable sector. Figure 11b shows that the wage share in non-tradables —an inverse measure of the mark-up in that sector— also fell, again with a partial, transitory recovery in the late 1990s and early 2000s. According to the previous analysis, both factors —the fall in the wage share and relative productivity in non-tradables— must have contributed to the drop in the manufacturing wage share.[10]

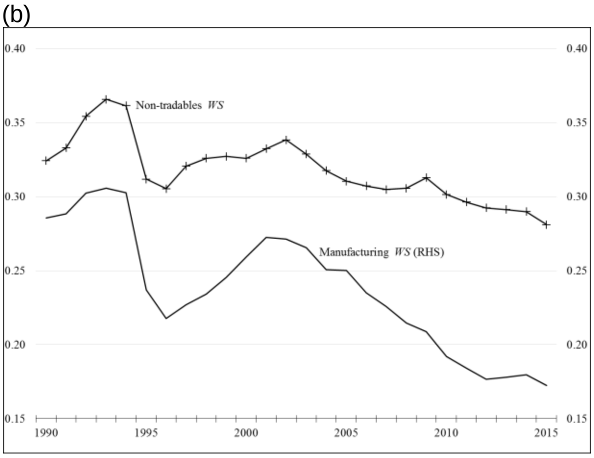
Figures 11c and 11d show two alternative indicators of the relative price of manufactures: the relative price of manufacturing value added with respect to that of non-tradables and —as a more general indicator of the relative price of tradables— the Bank of Mexico's real effective exchange rate index based on aggregate consumer prices. Both indicators exhibit a decrease from the early 1990s until the mid-2000s (including a transitory upward jump after the peso crisis of 1994–95), and a gradual recovery since the second half of the 2000s.

Figure 11: Basic determinants of the manufacturing wage share, 1990–2015: (a) Relative productivity; (b) wage share of non-tradables; (c) relative prices; (d) real effective exchange rate

(a)



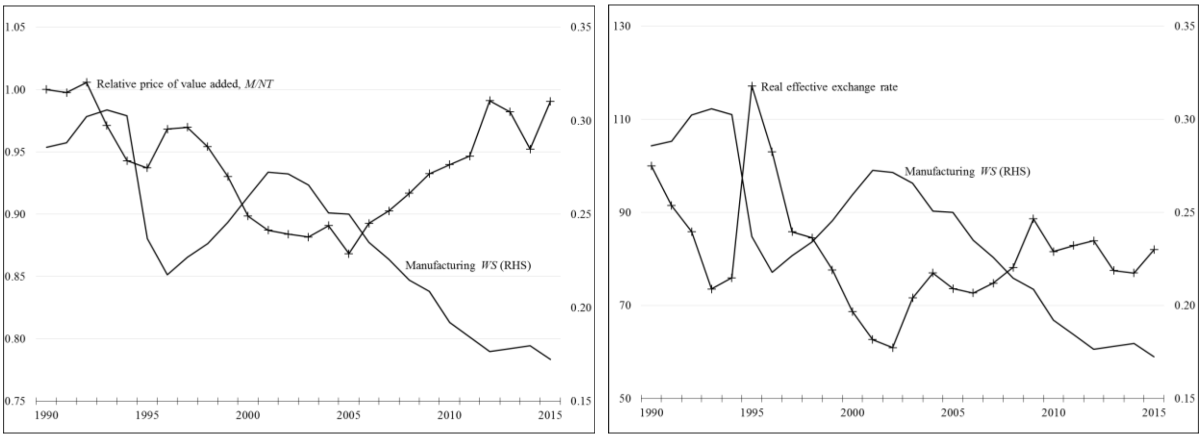
(b)



(c)

(d)

[10] See Sommer (2009) and Maarek and Orgiazzi (2015) for empirical evidence on the influence of an economy's dual structure on the evolution of the wage share across different country and industry samples. For a general presentation of dual-economy models in the tradition of classical development theory, see Ros (2013, Part II).



Notes: WS, wage share; LP, labor productivity; NT, non-tradables; M, manufacturing. An increase in the real effective exchange rate index—based on consumer price indices for 111 countries—means a real depreciation of the peso.
Source: Authors' calculations based on data from INEGI–KLEMS and Bank of Mexico.

According to the previous analysis, the increase in the relative price of manufactures (or alternatively, the real depreciation of the peso) since the mid-2000s was a likely factor in the fall of the manufacturing wage share recorded during the late phase. Moreover, the short-term fluctuations in relative prices help to explain those observed in the product wage and wage share during the early phase, with a real appreciation of the peso, fall in the relative price of manufactures, and rise in the wage share in the early 1990s; a sharp depreciation of the peso, increase in relative prices, and fall in the wage share in 1995–96; and a peso appreciation, gradual decline in relative prices, and increase in the wage share until the early 2000s. Note, however, that over the whole 1990–2015 period relative prices—which definitively show no upward trend—cannot explain the downward trend in the wage share.

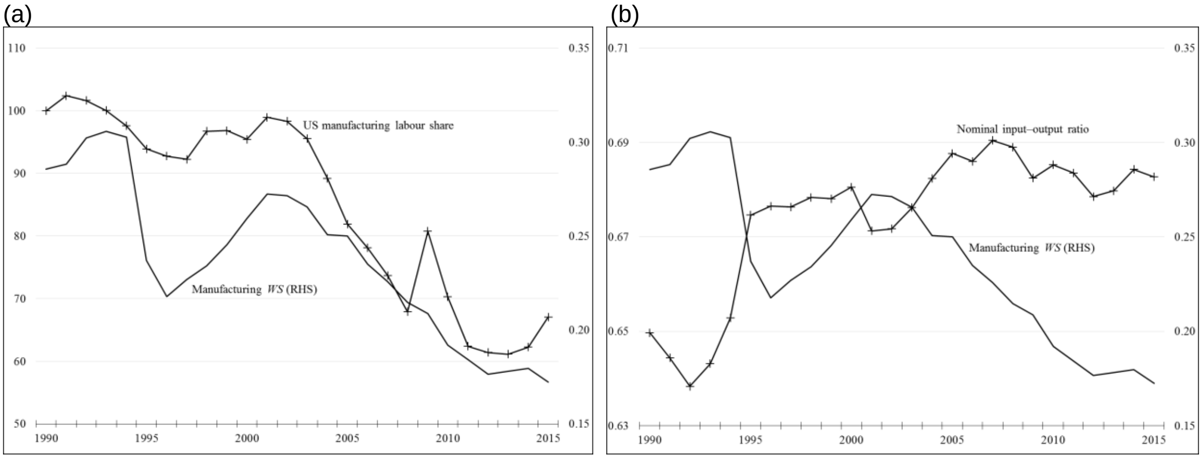
While the specific channels cannot be studied here, recent studies have argued that globalization —and in particular the threat by firms to relocate in other countries— may strengthen the bargaining position of firms in relation to workers, and thus result in a reduction in domestic labor costs and the wage share.[11] More specifically, under highly integrated markets changes in foreign wages may be more easily transmitted to domestic ones. As an indicator of foreign wages to Mexico, Figure 12a shows the evolution of the labor share in the US manufacturing sector. The US labor share experienced a dramatic fall—from an index level of

[11] Hutchinson and Persyn (2012) present empirical evidence of a positive correlation between the home wage share and foreign wage levels, and argue that a higher wage abroad strengthens the bargaining position of labor unions at home. Jaumotte and Tytell (2007) show a negative correlation between the labor share and the degree of offshoring in advanced economies. Stockhammer (2013) and Sommer (2009) present evidence of a negative effect of trade openness on the labor share. See OECD (2012) and Bassanini and Manfredi (2012) for further results and a general discussion of the empirical literature on the determinants of the wage share.

about 100 in the early 2000s to nearly 60 a decade later—beginning at the same time it did in Mexico and suggesting the existence of a link between the two variables. Moreover, given the relatively small size of the Mexican manufacturing sector, it seems plausible to assume that, if a significant correlation does exist, causality runs mainly from the United States to Mexico. Of course, the correlation may also reflect the influence of a third factor, such as the worldwide impact of China joining the World Trade Organization in 2001. Hung and Hammett (2013) show that the decline in the US manufacturing labor share took place as the share of imports from non-OECD countries, including from China, began to increase (see their Figure 4).

Figure 12: Additional determinants of the manufacturing wage share, 1990–2015: (a) US manufacturing labor share and (b) nominal input/output (IO) ratio, 1990–2015

(a) (b)



Source: Authors’ calculations based on data from INEGI–KLEMS and US Bureau of Labor Statistics.

While macroeconomic analysis typically focuses on value added, a more disaggregated approach may consider that firms make price and activity decisions in terms of gross production rather than value added, with the difference between the latter two variables corresponding to the value of intermediate goods used in production. Given the intensive use of intermediate goods in manufacturing, the latter variable may be important for the pricing decisions of firms, and hence for the behavior of mark-ups and the wage share.

Consider the price identity

(5a) $$p_q = (1+k)[(wL/Q) + (p_iI/Q)]$$

where p_q is the price index of gross production, k the mark-up on the unit cost (where the latter consists of the cost of labor and intermediate goods, wL/Q and p_iI/Q, respectively), Q is real gross production, p_i the price of intermediate goods, and I the real amount of intermediate goods. Dividing both sides of Equation (5a) by p_q we get

(5b) $$1 = [1+k][(PW_q/LP_q) + (p_iI/p_qQ)]$$

where p_iI/p_qQ is the nominal input/output (IO) ratio and $PW_q/LP_q = (w/p_q)/(Q/L)$ is the ratio of product wage to labor productivity in terms of gross production. The relation between these variables and the wage share is given by

(6a) $$WS = wL/VA = [PW_q/LP_q][p_qQ/VA] = [PW_q/LP_q]/[1 - (p_iI/p_qQ)]$$

where VA is nominal value added, and the last term on the right side uses the definition $p_qQ = p_iI+VA$ rewritten as $(p_qQ/VA) = 1/[1 - (p_iI/p_qQ)]$.

While Equations (5b) and (6a) are identities and thus cannot clarify issues of causality, they are nonetheless helpful in identifying restrictions that must hold ex-post. Thus, according to Equation (5b), if the nominal IO ratio increases exogenously, this must be matched by a reduction in the mark-up, the ratio of product wage to labor productivity, or both. In turn, by Equation (6a), if the adjustment involves a lower ratio of product wage to labor productivity, this would reduce the wage share (and thus increase the profit share) to an extent that depends on the relative changes in the product wage/productivity ratio and the nominal IO ratio itself.

Assume, for example, that firms are able to keep their mark-up constant after an increase in the nominal IO ratio. In this case, PW_q/LP_q must decrease by the same amount in which the nominal IO ratio increased. The decrease may occur because the more intensive use of inputs raises labor productivity (LP_q) and/or because firms are able to adjust their final prices, depressing the product wage (PW_q). Calculating the total change in Equation (6a) shows that the fall in the wage share will be

(6b) $$\Delta WS = -\{[1-WS]/[1-(p_iI/p_qQ)]\}\,\Delta(p_iI/p_qQ).$$

More generally, if the ratio of product wage to labor productivity falls by less than the increase in the nominal IO ratio, then according to Equation (5b) the mark-up must fall, while the wage share will fall (and the profit share will rise) by less than the amount indicated in Equation (6b).[12] Figure 12b shows the series for the nominal IO ratio in the Mexican manufacturing sector. Within a general upward trend, the ratio increased markedly during the peso crisis of 1994–95, and again in the early 2000s. Over the whole period, the ratio rose by 0.033 (or 3.3 percentage points), from 0.65 in 1990 to 0.683 in 2015. The potential impact on the wage share is large: using average values of 0.24 for the wage share and 0.67 for the nominal IO ratio, Equation (6b) implies that an increase of 0.035 in the nominal IO ratio would require a fall of nearly 0.08, or 8 percentage points, in the manufacturing wage share.

4.3.1 Econometric analysis

Based on the previous analysis, equations for the manufacturing wage share were estimated as a function of the relative productivity of labor in non-tradables with respect to manufacturing, the wage share in non-tradables (as an inverse indicator of the mark-up in that sector), and the relative price of manufacturing. An extended specification adds the US manufacturing labor share index and the nominal IO ratio. All the variables were converted to natural logs.

Standard tests showed that all the variables have unit roots and become stationary only after taking their first difference. In consequence, the equations were estimated within a cointegration framework. Given the small number of observations, the estimations followed the two-step Engle–Granger approach, which has the advantage of not requiring the use of lags or first differences, and thus maximizes the number of observations available for estimation; being single-equation, it also minimizes the number of coefficients to be estimated. As is well known, the approach consists of estimating an ordinary least-squares equation with the variables in levels, and then testing for the presence of a unit root in the regression residuals, which in this case was done through the augmented Dickey–Fuller and Phillips–Perron tests. If the unit-root

[12] Bentolila and Saint Paul (2013) argue theoretically that changes in the relative price of intermediate goods will affect the labor share in a direction that depends on the degree of substitution between capital and labor. Building on this insight, Hutchinson and Persyn (2012) find empirically a positive correlation between the labor share and the relative price of intermediate goods, which in their theoretical model holds when capital and labor are complements in production. López and Malagamba-Morán (2016) study the evolution of the wage share in the Mexican manufacturing sector during the period 1994–2009, and show graphically that the wage share is negatively correlated with the ratio of materials cost to wage cost.

hypothesis is rejected, then the equation can be interpreted as representing a 'long-run' or cointegration relationship between the variables in levels.

To address possible concerns about reverse causality, the equations were also estimated using the lagged values of the explanatory variables, which facilitates a causal interpretation of the estimated coefficients. Finally, as a further robustness test, the equations were estimated as error-correction autoregressive distributed lag (ARDL) models, following for that purpose the bounds-testing approach of Pesaran et al. (2001). In this approach, the existence of a long-run relationship can be tested by means of so-called F and t bounds tests. Among its main advantages, the approach can combine stationary and non-stationary variables (i.e. variables integrated of order zero or one), yields in a single step estimates of both the long-error coefficients and the error-correction term of the long-run relationship, and corrects for possible endogeneity bias through the use of lags of all the variables.

Table 4 presents a first set of estimated Engle–Granger equations. In the majority of cases the diagnostic tests are satisfactory, while the unit-root tests support the existence of a long-run relationship. As expected from the theoretical model, the estimated coefficients on the relative productivity of labor and the wage share in non-tradables show a positive sign, whereas those on either the real exchange rate or the relative price of manufacturing show a negative one. The estimated elasticities are large (more on this below) and their *p*-values suggest that they are statistically significant individually (although the individual *p*-values are only indicative, since the variables are non-stationary).

Table 4: Engle–Granger regressions for the manufacturing wage share, I

	(1)[a]	(2)[b]	(3)[b]	(4)[c] (lagged regressors)	(5)[d] (lagged regressors)	(6)[d] (lagged regressors)
Relative labor productivity NT/M	1.23 (0.00)	1.09 (0.00)		1.31 (0.00)	1.04 (0.00)	
Wage share in NT	2.11 (0.00)	1.57 (0.00)	1.51 (0.00)	2.36 (0.00)	2.27 (0.00)	1.81 (0.00)
Real effective exchange rate	–0.21 (0.00)			–0.02 (0.02)		
Relative price of value added, M/NT		–1.49 (0.00)	–1.24 (0.00)		–0.60 (0.06)	–0.79 (0.00)
Labor productivity in NT			0.79 (0.00)			0.58 (0.19)
Labor productivity in M			–1.00 (0.00)			–0.98 (0.00)

Diagnostics (*p*-values)						
Normality (Jarque–Bera)	0.924	0.986	0.788	0.331	0.759	0.393
Serial correlation (Breusch–Godfrey)	0.113	0.128	0.063*	0.991	0.557	0.364
ARCH	0.561	0.513	0.721	0.596	0.650	0.667
RESET	0.028**	0.255	0.535	0.456	0.214	0.495
Adjusted R^2	0.951	0.973	0.975	0.939	0.905	0.913
Unit-root tests						
Augmented Dickey–Fuller[e]	–3.85 +++	–3.68 ++	–3.33 ++	–4.69 +++	–4.34 +++	–4.00 +++
Phillips–Perron	–3.48 ++	–3.85 ++	–3.37 ++	–4.69 +++	–4.34 +++	–3.98 +++

Notes: NT, non-tradables; M, manufacturing. Dependent variable = wage share in manufacturing. Ordinary least-squares estimation. Sample period: 1990–2015, 26 annual observations. All the variables are expressed in natural logs. For illustrative purposes, *p*-values are shown in parentheses, next to the estimated coefficients. All the equations include an intercept (not shown), except in column (6), from which it was removed due to lack of significance. [a]Includes outlier year dummies for 1992, 1993, and 1994 (not shown). [b]Includes outlier year dummies for 1990 and 1994 (not shown). [c]Includes outlier year dummies for 1993, 1994, and 1995 (not shown). Regressors were lagged one year. Sample was reduced to 1991–2015. [d]Includes outlier year dummies for 1994 and 1995 (not shown). Regressors were lagged one year. Sample was reduced to 1991–2015. [e]Maximum lag of 1, defined by Akaike's criterion. +, ++, +++: Rejects the unit-root hypothesis at 10, 5, and 1 per cent, respectively. Source: Authors' estimations.

Table 5 presents extended wage-share equations that include the IO ratio and the US manufacturing labor share. In all cases the unit-root tests keep supporting the existence of a long-run relationship. Moreover, the previous results concerning the sign and statistical significance of the coefficients on relative labor productivity, the relative price of manufacturing, and the wage share in non-tradables continue to hold. Regarding the new variables, the Mexican manufacturing wage share is positively correlated with the US labor share, as expected, and negatively so with the nominal IO ratio [column (1)]. Similar estimation results are obtained when relative labor productivity is decomposed into productivity in non-tradables and manufacturing [column (2)]. Again, using the lagged values of the explanatory variables does not change qualitatively the results, but quantitatively there is an increase in the size of the estimated coefficient on the wage share in non-tradables, and a decrease in the coefficients on the relative price of manufacturing and the IO ratio, where the latter in the final equation approaches zero in economic terms [see columns (3) and (4)].

Table 5: Engle–Granger regressions for the manufacturing wage share, II

	(1)[a]	(2)[b]	(3)[b] (lagged regressors)	(4)[c] (lagged regressors)
Relative labor productivity NT/M	0.69 (0.00)		0.76 (0.00)	

Wage share in NT	0.62 (0.00)	0.60 (0.00)	0.98 (0.01)	0.96 (0.04)
Relative price of value added, M/NT	–1.69 (0.00)	–1.74 (0.00)	–0.61 (0.03)	–0.33 (0.27)
US manufacturing labor share index	0.25 (0.00)	0.20 (0.01)	0.39 (0.00)	0.58 (0.06)
Nominal input/output ratio in M	–2.56 (0.00)	–2.71 (0.00)	–0.60 (0.00)	–0.03 (0.91)
Labor productivity in NT		0.56 (0.00)		1.27 (0.09)
Labor productivity in M		–0.68 (0.00)		–0.85 (0.00)
Diagnostics (*p*-values)				
Normality (Jarque–Bera)	0.624	0.511	0.144	0.412
Serial correlation (Breusch–Godfrey)	0.197	0.179	0.467	0.622
ARCH	0.308	0.144	0.548	0.647
RESET	0.090*	0.129	0.908	0.530
Adjusted R^2	0.988	0.987	0.916	0.911
Unit-root tests				
Augmented Dickey–Fuller[e]	–4.11 +++	–3.58 ++	–4.10 +++	–4.36 +++
Phillips–Perron	–3.41 ++	–3.57 ++	–4.09 +++	–4.36 +++

Notes: NT, non-tradables; M, manufacturing. Dependent variable = wage share in manufacturing. Ordinary least-squares estimation. Sample period: 1990–2015, 26 annual observations. All the variables are expressed in natural logs. For illustrative purposes, *p*-values are shown in parentheses, next to the estimated coefficients. [a]Includes intercept and an outlier year dummy for 1990 (not shown). [b]Includes an outlier year dummy for 1995 (not shown) and an intercept. Sample was reduced to 1991–2015. [c]Maximum lag of 1, defined by Akaike's criterion. +, ++, +++: Rejects the unit-root hypothesis at 10, 5, and 1 per cent, respectively.
Source: Authors' estimations.

Finally, Table 6 presents wage-share equations estimated as error-correction ARDL models. Consistent with the previous results, the equations show large, negative error-correction coefficients and both the *F* and *t* bounds tests support the existence of a long-run relationship. The new results confirm those obtained previously: the wage share in manufacturing is positively correlated with the relative productivity in non-tradables, the wage share in that sector, and the US manufacturing labor share, and it is negatively correlated with the relative price of manufactures and the IO ratio, although the latter may not be statistically significant.

Table 6: Bounds-testing regressions for the manufacturing wage share

	(1)	(2)
Error correction coefficient	–0.58 (0.00)	–0.42 (0.00)
Long-run coefficients		
Relative labor productivity NT/M	1.09 (0.01)	0.92 (0.02)
Wage share in NT	0.89 (0.05)	0.88 (0.07)
Relative price of value added, M/NT	–1.14 (0.01)	–1.08 (0.02)
US manufacturing labor share index	0.26 (0.00)	0.25 (0.01)
Nominal input/output ratio in M	–0.11 (0.30)	

Diagnostics (*p*-values)		
Normality (Jarque–Bera)	0.905	0.561
Serial correlation (Breusch–Godfrey)	0.912	0.632
ARCH	0.772	0.935
RESET	0.525	0.193
Adjusted R^2	0.979	0.977
Bounds tests		
t-test	–3.78*	–3.48*
F-test	4.53**	5.11***

Notes: NT, non-tradables; M, manufacturing. Dependent variable = wage share in manufacturing. Error-correction ARDL models estimated by ordinary least squares. Sample period: 1992–2015, 24 annual observations. All the variables are expressed in natural logs. For illustrative purposes, *p*-values are shown in parentheses, next to the estimated coefficients. All the equations include an outlier year dummy for 2006 (not shown) and no intercept. Bounds testing: Rejects the null of no long-run relationship at *10, **5, and ***1 per cent.
Source: Authors' estimations.

The results suggest that the evolution of the wage share and relative productivity in the non-tradable sector and the US manufacturing labor share contributed significantly to the fall in the Mexican share. More specifically, during the period 1991–2015 the Mexican manufacturing wage share fell by 0.51 in natural logs, or 40 per cent with respect to its value in 1990. Using the observed change in the explanatory variables and the value of the estimated coefficients in column (3) in Table 5, it can be calculated that the fall in the relative productivity of non-tradables, in the wage share in the same sector, and in the US manufacturing labor share each tended to produce a fall of between 0.15 and 0.17 in natural logs in the Mexican wage share. In contrast, the relative price of manufacturing played a minor role, which is not surprising since over the whole period the change in the relative price was small. However, changes in relative prices appear to have played a significant role in the short-term fluctuations of the manufacturing wage share, as initially pointed out.

5 Conclusions

According to the previous analysis, a major factor behind the fall in the wage shares in the formal subsectors of the economy has been the poor performance of labor productivity in the informal ones. This poor performance is behind the rising productivity differential between formal and informal subsectors in the non-tradable sector, which is a factor in the falling adjusted wage share in non-tradables and also in the falling relative productivity of the non-tradable sector vis-à-vis manufacturing—which in turn is partly responsible for the fall in the manufacturing wage share. The overall role of declining productivity levels in the self-employment activities of the non-tradable sector in the fall of the wage and labor income shares in the private business sector was remarkably conveyed by Figure 10: the productivity decline in self-employment starts in the early 2000s (especially after 2003) at precisely the time when the relationship between product-wage and labor-productivity growth shifts down in manufacturing and the overall wage and labor income shares start falling after the ups and downs of the period 1990–2002.

The poor productivity performance of the informal subsectors can be attributed in part to the poor growth performance of the formal ones. Slow economic growth, by preserving low or producing even declining levels of productivity in the informal subsectors, contributes to the fall in the wage share; the slower the growth of productivity in the informal subsectors, *ceteris paribus* the stronger the tendency for the wage shares in the formal subsectors to fall. If the productivity of the informal subsectors is inversely related to their size, due to some form of diminishing returns to labor in this sector, there is here a link between the downward trend in the formal wage shares and the slow expansion of the capital stock in the formal subsectors.

But, why have the reduction in the labor share and its positive impact on profitability failed to raise the accumulation rate? In what follows we point to three hypotheses, whose detailed study is left for future research. A first hypothesis centers on the stagnation of real wages and its negative effect on domestic demand. By restraining the size of the domestic market, the stagnant real wages may depress utilization rates and profit rates (as opposed to profit shares), and discourage firms from accumulating capital and expanding their capacity.

To some extent, firms in the tradable sector may avoid this outcome by shifting from domestic to foreign markets. In the non-tradable sector, however, this option is not available, and thus capital accumulation may more fully reflect the negative impact of stagnant real wages. Moreover, even in the tradable sector there could be a negative impact, as an imperfectly elastic foreign demand may limit the extent of shift to foreign markets by domestic firms. This shift, finally, may have been complicated by the medium-term appreciation of the real exchange rate of the peso, which was not fully offset by the depreciation episodes of 2003–04 and 2008–09 (recall Figure 11d). In an unfortunate combination, over the whole 1990–2015 period the real appreciation of the peso did not have at least the side benefit of raising the real product wage.

5.1 Profitability in the US manufacturing sector

A second hypothesis focuses on the evolution of profitability in the US manufacturing sector. As shown previously, as the labor share in the Mexican manufacturing sector fell from levels of about 30 per cent at the start of the 2000s to about 20 per cent 15 years later, the US labor share experienced a similarly sharp fall, from an index level of about 100 to 65 during the same period (recall Figure 12a). This implies that if investment decisions in the Mexican manufacturing sector (and perhaps in other sectors as well) depend not on the domestic profitability alone but on relative profitability with respect to the United States —an assumption that seems plausible in a setting of high capital mobility and industrial integration between the two countries, and where therefore the decision to be made is not only whether to invest but where to do it— then capital accumulation in Mexico may have been inhibited by the increasing profit share in the United States, offsetting the potentially positive effect of higher profit shares in Mexico.

Ibarra (2016) finds support for this hypothesis. In estimated equations for private investment for the whole Mexican economy, he finds a negative and highly significant effect of relative unit labor costs in Mexico's manufacturing vis-à-vis US manufacturing on private investment. Thus, an equivalent way of explaining the slow pace of capital accumulation under decreasing labor costs is that private investment responds not to the profit margin in the tradable sector but to the relative profit margin vis-à-vis the United States, the main source of foreign direct investment in Mexico's manufacturing sector.

5.2 Marx-biased technical change and the elasticity of factor substitution

In a final hypothesis, the lack of response of capital accumulation to the falling labor share may be explained by a disconnection between the profit share and profit rate, as a result of which the profit rate may fall even as the profit share rises. By definition the profit rate can be written as $r = su/p_k$, where s is the profit share (the ratio of gross operation surplus to gross value added in nominal terms), u the output/capital ratio (the ratio of gross value added to net capital stock in real terms), and p_k the relative price of capital goods (the ratio of the implicit price index of gross capital formation to that of gross value added). Figure 13 shows series for these variables in the Mexican manufacturing sector during the period 1990–2015.[13] As must be the case, the profit

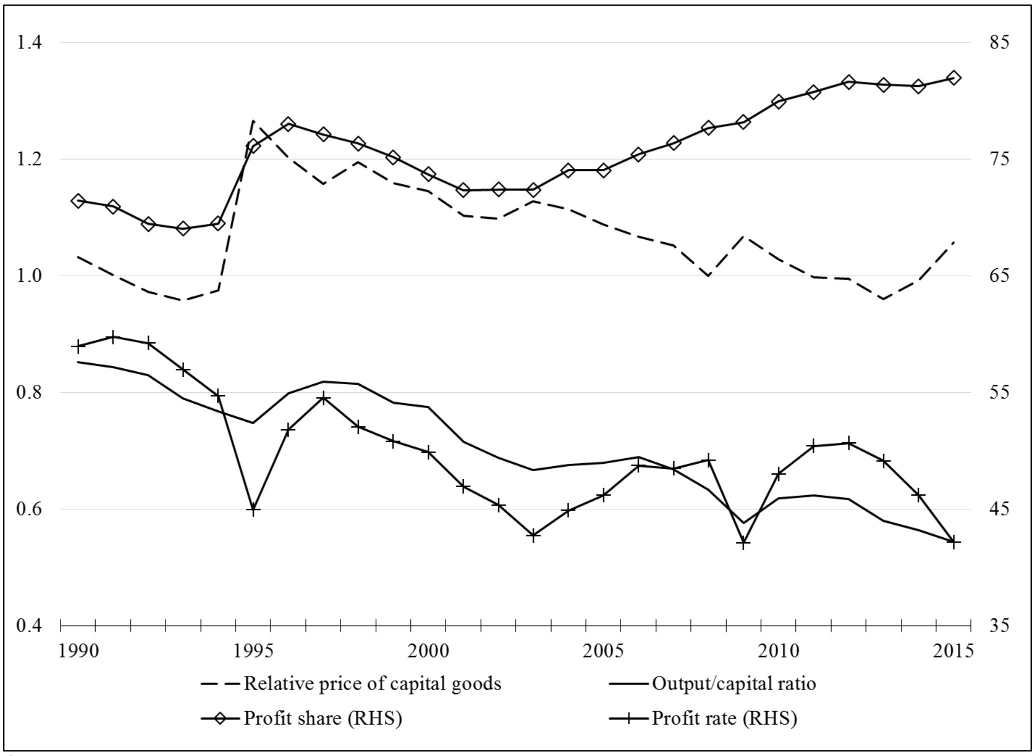
[13] While the analysis focuses on the manufacturing sector, a preliminary exploration of data suggests that, despite the fall in the wage and labor shares, the profit rate may have failed to increase also in both the whole tradable and non-tradable sectors. On the other hand, in order to use manufacturing data for the entire 1990–2015 period the calculations do not adjust for non-wage (self-employment) labor income (nor for net production taxes, which are a very small and constant share of value added), and thus they over-estimate the *level* of the profit share, which actually would be given by $s = 1 - WS - (LIS - WS)$.

share mirrors the evolution of the wage share. Beyond short term fluctuations, the profit share increased over the whole period, rising from levels of about 70 per cent to more than 80 per cent. In the more recent period, when the wage share experienced a sharp fall, the profit share rose from about 72 per cent in 2001–03 to 82 per cent in 2015. Yet, despite the increase in the profit share, the profit rate fell, from nearly 60 per cent in the early 1990s to about 45 per cent in 2014–15. In the more recent period, while the profit share rose by ten percentage points, the profit rate fluctuated but eventually remained flat.

By definition, the disconnection between the share and rate of profit must be explained by the combined evolution of the output/capital ratio and the relative price of capital goods. The latter variable showed no permanent change over the whole 1990–2015 period. Moreover, in the more recent period it tended to fall (after increasing sharply in the aftermath of the 1994–95 peso crisis), which by itself must have pushed up the profit rate. The fall of the profit rate in the medium run —and its flat trend in the more recent period— must therefore be explained by a fall in the output/capital ratio, strong enough to offset the effect from the rise in the profit share and, in the more recent period, the fall in the relative price of capital goods. Indeed, as shown in Figure 13, the output/capital ratio fell from more than 0.8 in the early 1990s to less than 0.6 in recent years.

Figure 13: Manufacturing profit rate and its components, 1990–2015

However, since during the period under analysis the share of non-wage *labor* income in value added ($LIS - WS$) was small and approximately constant, the *change* in the profit share is not being over-estimated.



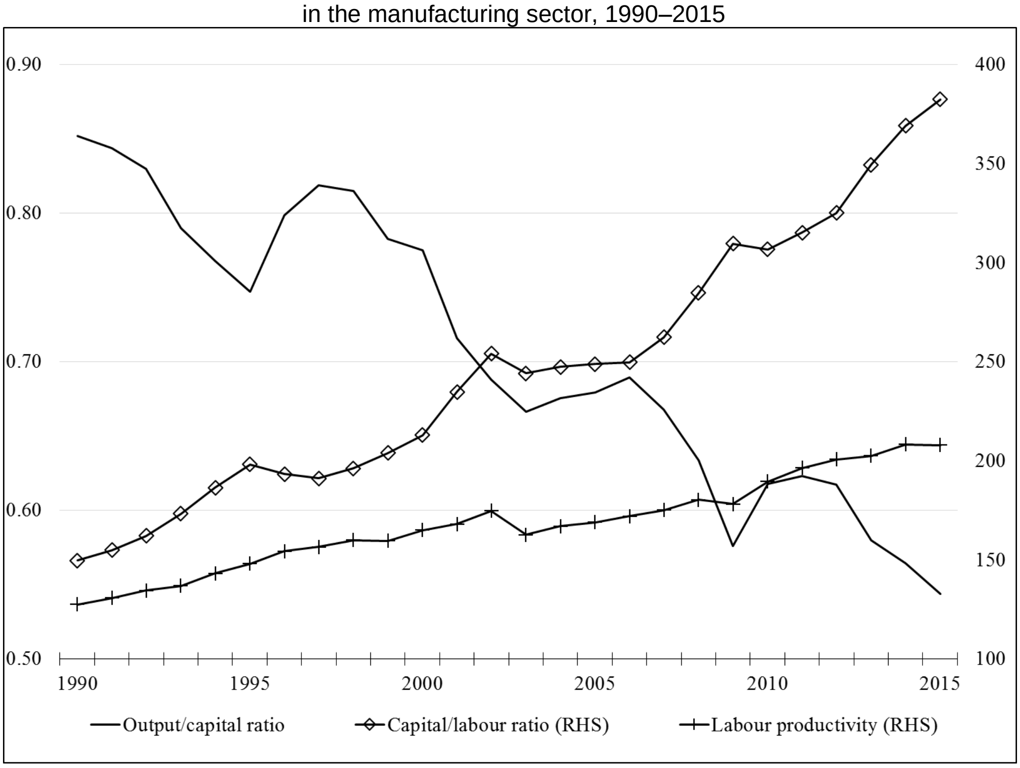
Source: Authors' calculations based on data from INEGI–KLEMS.

In the short run, the output/capital ratio can reflect changes in aggregate demand and capacity utilization. However, a steady fall over a quarter century cannot be plausibly attributed to a decrease in capacity utilization. As an alternative explanation, consider that by definition the output/capital ratio equals the ratio of labor productivity to the capital/labor ratio, $u = (VA'/L) / (K'/L)$, where VA' is real value added, L the amount of labor, and K' the real capital stock. From this definition, the output/capital ratio will fall when changes in production conditions are such that labor productivity increases proportionally less than does the capital/labor ratio, in what is sometimes called a pattern of Marx-biased (i.e. labor-saving and capital-using) technical change (see Foley and Marquetti 1999).

Figure 14 shows series for the output/capital ratio, labor productivity, and the capital/labor ratio in manufacturing. Both labor productivity and the capital/labor ratio increased over time. As expected, however, labor productivity lagged behind. Thus, during 1991–2015 labor productivity grew at a (geometric) average rate of 2 per cent per year, whereas the capital/labor ratio grew at 3.8 per cent. The gap in the growth rates between labor productivity and the capital/labor ratio implied a fall in the output/capital ratio at an annual rate of 1.8 per cent, with a negative effect on the profit rate.

Figure 14: Labor productivity and the output/capital and capital/labor ratios

in the manufacturing sector, 1990–2015



Notes: Labor productivity and the capital/labor ratio are measured in constant pesos (at 2008 prices) per worked hour.
Source: Authors' calculations based on data from INEGI–KLEMS.

These trends —falling labor share and rising capital/output ratio— are also consistent with movements along a production function with a high (greater than unity) elasticity of factor substitution. This appears to be Piketty's (2013) conjecture about the technological factors accounting for increasing income concentration at the top over the past few decades. However, we believe that biased technical progress is a more satisfactory explanation in the context of an economy, like the Mexican one, where real wages are not rising and triggering substitution of capital for labor along a given production function. The Mexican economy has been characterized over the past decade, in which we have witnessed more clearly those trends, by real wage stagnation or even decline.

These three hypotheses are not mutually exclusive in the sense that some factors may be constraining accumulation in some sectors whereas investment in other sectors in the economy is inhibited by other mechanisms. For example, real wage stagnation may be a demand-side constraint on accumulation in the modern non-tradable sector whereas manufacturing industries are subject to problems of relative profitability vis-à-vis the United States or to the negative effects on the rate of profit and accumulation of capital-using and labor-saving technical progress.

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