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

**Model appendix: Pricing and the wage share in a small open developing economy**

**Production, technology and pricing**

Consider a small open developing economy with two main sectors producing tradable goods and non-tradables goods. Tradable goods (T) are produced with a fixed coefficients production function: YT = min (aKT, bTLT), where Y is output, K is the capital stock, and L is the level of employment. T goods are exported (in negative amounts when they are imported) in addition to being sold internally, and firms in this sector are price takers in domestic and foreign markets. They thus produce up to full capacity since this is the level of output that maximizes their profits. This implies:

(B.1) YT = aKT,and

(B.2) pT = epT\*,

where pT is the price of tradables in domestic currency, pT\* is the price in foreign currency, and e is the nominal exchange rate.

The non-tradable goods sector, which produces for the domestic market, includes two subsectors. In a modern subsector (N), goods are produced with a fixed coefficients production function: YN = min (aKN, bNLN) and firms in this subsector operate under imperfect competition, pricing their goods by adding a mark-up over labor costs (more on the determinants of the mark-up below). They normally produce at less than full capacity so that changes in domestic demand affect their output, unlike what happens in the T sectors where changes in domestic demand crowd out (or in) net exports. Thus in the modern N sector:

(B.3) YN = bNLN, and

(B.4) pN = (1+z) w/bN,

where z is the mark-up, and w, the nominal wage (assumed to be uniform across the tradable and modern non tradable sectors). Note that according to (B.4), the product wage in the N sector (w/pN) is determined by productivity and the mark-up: w/pN = bN/(1 + z).

Coexisting with the modern non tradable sector is an informal, labor intensive sector (S) producing non tradable goods according to:

(B.5) YS = bSLS

Since in this sector pSYS = wSLS, where wS is earnings per worker in the informal sector, we have:

(B.6) pS = wS/bS

which implies that the product wage wS/pS in this sector is determined by labor productivity: wS/pS = bS.

**Determinants of the mark-up in the N sector and wage differentials**

Before looking at the demand side, let’s see some implications of the assumptions made so far. Consider first the case in which the N and S sectors produce the same good so that: pS = pN. In this case, firms in the imperfectly competitive N sector will be constrained by limit pricing to sell at the same price as the self-employed in the S sector. If in addition, labor earnings in S and N are equalized, the mark-up in the N sector will be uniquely determined by the relative productivity bN/bS. Indeed, from (B.6) and (B.4) pS = pN implies that wS/bS = (1+z)w/bN. If in addition, w = wS, it follows that (1+z) = bN/bS. The wage share, inversely related to the profit mark-up, varies in this case inversely with the relative productivity of the N sector vis a vis the S sector.

Similar results are obtained in a more general setting without full equalization of labor earnings. Suppose a uniform wage prevails in the formal sectors of the economy (the tradables and modern non tradables sectors) while informal earnings (wS) and formal wages (w) are 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:

(B.7) wS = w [LF/(LF + U)] LF = LT + LN

which implies:

(B.7’) w/wS = 1 + U/LF

where LF is total formal employment and U is open unemployment. Equation (B.7´) implies that the formal wage premium, (w – wS)/wS, is an increasing function of the unemployment rate (expressed as a fraction of formal employment, LF). An increase in the unemployment rate reduces expected formal wages and the equalization of expected earnings takes place at a relatively higher level of the formal wage.

Assume again that the N and S sectors produce the same good so that: pS = pN (or alternatively that there is a constant formal price premium given by the price elasticity of demand for N goods). As already mentioned, from (B.6) and (B.4) it follows that wS/bS = (1+z)w/bN, which implies:

(B.8) w/wS = bN/bS(1+z)

which establishes that the formal wage premium increases with the relative productivity (bN/bS) of the N sector and decreases with the mark-up. We also assume the mark-up in the N sector to be a function not only of market power in the goods market (as reflected in the price elasticity of demand for firms in this sector) but also of monopsonistic power in the labor market which depends on the unemployment rate, u, expressed as a fraction of the formal labor force: z = z (u) z’ > 0, where u = U/LF. If the price elasticity of demand is acyclical, the model implies a countercyclical behavior of the mark-up in the N sector, rising when unemployment increases and declining when unemployment falls.

Equations (B.7’) and (B.8) determine simultaneously the wage differential between formal and informal earnings and the unemployment rate (see figure B.1). Note, in particular, that an increase in bN/bS, a faster increase in labor productivity in the N sector than in the S sector, will tend to raise u, w/wS and the mark-up z in the N sector. With a higher mark-up, the wage share in the N sector will tend to fall. The mechanism is as follows. An increase in bN (given bS), increases w/pN for a given z (equation B.4). The formal wage premium increases (as w/wS rises) and informal workers enter the formal labor market thus increasing unemployment until w/wS is again equal to 1+u. The increase in u allows firms in the N sector to raise their mark-up with the result that the wage share in sector N falls. The real consumption wage w/pN increases (although less than productivity) since wS/pS has not changed, pS is equal to pN and w/wS has increased. It follows that a key factor driving the wage share in the N sector is its relative productivity vis a vis the informal sector.

Figure B.1. Wage differential and unemployment rate

w/wS

w/wS = 1+u

w/wS = bN/bS (1+z(u))

u

**Demand and equilibrium employment levels**

On the demand side, we assume that the tradables sector produces only investment and intermediate goods for export and the N and S sectors produce only consumer goods. Workers do not save and capitalists consume a given fraction (c) of their profits. Thus,

(B.9) pNCN + pSCS = w (LT + LN) + wSLS + c (PT + PN)

where P and C denotes profits and consumption levels. Since CS = YS and pSYS = wSLS, equation (B.9) simplifies to:

(B.9’) pNCN = w (LT + LN) + c (PT + PN)

We also have:

(B.10) LT = (a/bT)KT, given equation (B.1)

And, using the definition of profits, PT and PN can be shown to be:

(B.11) PT = (pT - w/bT)aKT , and

(B.12) PN = zwLN

Substituting (B.10), (B.11) and (B.12) into (B.9’) and using (B.3), (B.4) and the fact that YN = CN, we can solve for the equilibrium level of LN as well as LF = LT + LN:

(B.13) LN = A KT A = a [(1 – c)/bT + cpT/w]/z (1-c)

(B.14) LF = [(a/bT) + A] KT

which show LN (and LF) determined by the capital stock in the T sector. The logic is as follows. Demand for T goods is perfectly elastic at the world market price, and total employment and income in the T goods sector is determined by existing capacity in this sector. Income derived in the T sector then provides autonomous domestic demand for the N goods sector, triggering an income-expenditure multiplier process in the N sector. Employment levels are also affected by a number of parameters or exogenous variables. A lower product wage in the T sector (w/pT), which does not reduce the real consumption wage (w/pN), raises LN and LF as profits and capitalist consumption increase in the T sector. A higher mark-up z, as determined by equations (B.7’) and (B.8), leads to a lower level of employment in the N and the formal sectors as it reduces real consumption wages and demand for N goods. Equation (11), which implies that PT/pTYT = 1 – w/pTbT, shows that the profit share in the T sector increases with a lower product wage (w/pT) and a higher labor productivity bT.

Finally, the level of employment in sector S is residually determined as:

(B.15) LS = L – LF - U

where L is the exogenous total labor force, LF is determined by (B.14), U is determined as uLF with u determined by (B.7’) and (B.8). Note that in the model the relative size of the informal sector LS/L depends inversely on the ratio of the capital stock in the T sector to the total labor force. Dividing both sides of (B.15) by L and using (B.14):

(B.15’) LS/L = 1 - [(a/bT) + A] KT/L – U/L

**Determinants of the wage shares in the formal sectors**

The wage share in the tradable goods sector (WST) is wLT/pTYT or w/pTbT = (w/pN)(pN/pT)/bT which, using the expression for the real consumption wage in the formal sectors, w/pN = bN/(1+z), can be expressed as:

(B.16) WST = (bN/bT)(1/(1+z))(1/rer) where rer = pT/pN

which shows the wage share in the tradables sector as an inverse function of the relative productivity (bT/bN) of the T sector vis a vis the N sector, the mark-up in the N sector (a higher mark-up implies a lower real consumption wage in the formal sectors), and the real exchange rate (pT/pN) (a higher RER raises profits in the T sector). These implications are in conformity with the stylized facts which show: 1) a sharp long term decline of WST along with relatively fast growth in T sector productivity and a long term increase in the N sector mark-up; 2) fluctuations in WST that are inversely correlated to those of the real exchange rate; 3) a close correlation across T sectors between the fall in the wage share and the rate of increase in productivity.

The wage share in the modern non tradable sector (WSN) is inversely related to the mark-up in the N sector:

(B.17) WSN = wLN/pNYN = 1/(1+z) [using equation (B.4)]

The mark-up in turn is crucially determined, according to equations (B.7’) and (B.8), by the relative productivity bN/bS of the N sector vis a vis the informal sector. This has two implications which appear also to be in conformity with the stylized facts: 1) the more moderate decline of the wage share in the N sector (compared to the T sector) as productivity growth in this sector has been relatively sluggish (although faster than that of the informal sector); 2) the inverse correlation between the change in the wage share and productivity growth across N sectors.

Another implication of the model is that the slower the growth of productivity in the informal sector, the stronger ceteris paribus will be the tendency for the wage shares of the formal sectors to fall. If the productivity of the informal sector is inversely related to the size of the informal sector (LS/L), due to some form of diminishing returns to labor in the S sector, there is here a link between the downward trend in the formal wage shares and the slow growth of the capital stock particularly in the T sector [equation (B.15’)]. Slow economic growth, by preserving low or producing even declining levels of productivity in the informal sector, contributes to the fall in the wage share. Another interesting implication is that policies to promote formal employment —including redistribution towards wages in the form of a lower mark-up in the N sector which raises employment in that sector [equation (B.13)]— and contribute to a smaller size of the informal sector [equations (B.15) and (B.15’)] will lead to a higher level of productivity in this sector with a positive impact on the wage shares of the formal sectors. Indeed, the higher level of productivity in the S sector will tend to reduce the mark-up in the N sector with a positive effect on WSN and WST [see equations (B.16) and (B.17)].