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Mexico: food price increases and growth constraints

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This paper uses dynamic panel techniques to evaluate the extent to which Mexico's consumer price index will be affected by food price inflation in the long term. We argue that sharp increases in international food prices (of the type seen since 2001) are likely to persist and to reinforce domestic growth constraints in Mexico. Our results suggest that in an economy like Mexico's that is highly dependent on imported food, the consumer price index will be noticeably affected by international food price increases. Conducting monetary policy without reference to the structural issue of food price inflation is therefore likely to be ineffective in controlling inflation and could be damaging in terms of its impact on demand and growth. Thus, the revitalization of the Mexican agricultural sector should be a centrepiece of future counter-inflationary policy.

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I
Introduction

International commodity prices increased by around 195% in real terms during the 2001-2008 period. Food prices, in particular, practically doubled during the period (IMF, 2010; see also ECLAC, 2008), reaching unprecedented levels. Given the nature of the factors driving it, food price inflation cannot be viewed as a temporary phenomenon. On the demand side, pressure on food prices is stemming from the sustained and rapid growth of key emerging economies (mainly China and India) as well as from the generation of new sources of energy derived from basic food grains such as maize. On the supply side, global climate change and lags in technological development are adversely affecting efforts to increase production. In the near future therefore, the demand for food is expected to considerably outstrip supply. This, in turn, has led to predictions of rising international food prices for at least the next 10 years (OECD/FAO, 2010). The era of cheap food, in other words, has come to an end (see *The Economist*, 2007, 2008, 2009).[1]

At the same time, the demand for food from net food importers will continue growing, according to Bruinsma (2003, p. 235): "The outlook to 2030 suggests that the agricultural trade deficit of developing countries will widen markedly, reaching an overall net import level of US$ 31 billion. Net imports of food will increase to about US$ 50 billion." These two likely developments represent bad news for developing economies that are net importers of food. Food price inflation will increase poverty. According to the Inter-American Development Bank (IDB, 2008), for example, in Latin America there is the risk that more than 26 million people will be pushed into extreme poverty due to food price inflation (see also FAO, 2008, for a broader international view along the same lines).

Another important but rarely analysed negative effect of food price inflation and food dependency is their impact on demand growth constraints. Such constraints exist because in developing countries, unlike rich countries, food weighs heavily in the consumer price index (CPI).[2] Thus, food price inflation is very likely to pass through to the CPI of developing economies that are net importers of food. Faced with rising domestic inflation, the authorities are likely to respond with conventional monetary and fiscal measures to tame inflationary pressures. If the source of inflationary pressure is structural, however, such efforts might well prove ineffective. The direct consequence of fighting inflation by conventional means will be to constrain growth by way of lower investment. In other words, international food price inflation might create (or at least reinforce) the so-called domestic demand growth constraint (see Kalecki, 1954; Noyola, 1956; Sunkel, 1958) in food-dependent developing economies.

In the same vein, food price inflation and food dependency might also exercise indirect upward pressure on inflation through the external accounts. This might occur in two different ways. First, when international food prices are soaring, more foreign exchange is needed to meet the demand for food imports. A shortage of foreign exchange coupled with an unsustainable current account deficit might generate expectations that the government will seek to devalue the currency in the near future in order to correct the external deficit. Expectations of a future devaluation will feed inflation expectations. This, in turn, will make the authorities tighten monetary and fiscal policy, restricting growth as a result. Second, if domestic inflation increased as a result of food price inflation, the real exchange rate would appreciate, causing the economy to lose international competitiveness. Exports would fall and imports, in all likelihood, would increase. This would lead to a deterioration of the external accounts. To rectify this disequilibrium, the authorities might decide to reduce aggregate demand, a decision that would inevitably have the effect of constraining growth further.

Against this background, the objective of this paper is to explore the growth-constraining effects of food price inflation. In particular, it seeks to illustrate the extent

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[1] *The OECD-FAO Agricultural Outlook, 2010-2019* (OECD/FAO, 2010, p. 1) points out that average maize and coarse grain prices are projected to be nearly 15% to 40% higher in real terms over the next 10 years than in 1997-2006.

[2] Food generally accounts for about 10% of the CPI in developed countries. In developing economies, food can account for 50% to 60% of the CPI (*The Economist*, 2007).

to which food price inflation might affect domestic inflation and thus result in – or reinforce – the domestic growth constraint. The Mexican economy is used as a case study in this paper because its food dependency (particularly for imports of basic food grains) has been steadily growing since the mid-1980s, following trade liberalization policies sealed by the launch of the North American Free Trade Agreement (NAFTA). At the same time, the foodstuffs component still has a large weight in Mexico's CPI. As a result, Mexico risks being caught in a dilemma, with international food price inflation causing domestic inflation to rise and the authorities finding it ever harder to keep inflation within its target range, so that they respond with growth-constraining macroeconomic policies. To measure the extent to which food price inflation will affect Mexico's CPI in the long term, we apply dynamic panel techniques.

The paper is organized as follows. Section II describes how food price inflation and food dependency can both give rise to and reinforce demand growth constraints. Our analysis employs structural inflation theory, but focuses on the case of an open developing economy with food dependency in a scenario where international food prices are rising. Section III presents evidence for Mexico's high dependence on imported food and its influence on the country's CPI. Section IV then presents the dynamic panel estimates. The final section sets out our concluding remarks.

II

The macro effects of food price inflation and food dependency: the materialization of demand growth constraints

A primary objective in developing economies is to expand output (and employment) rapidly and sustainably.[3] A sine qua non for achieving this goal, generally ignored by the literature, is the reduction (or if possible the elimination) of so-called growth constraints (see Sakar, 1988; Storm, 1997).

These constraints are associated with excessive inflation and balance-of-payments disequilibria, both the consequence of policies to expand aggregate demand. The former is generally identified, for obvious reasons, as the domestic demand growth constraint, whereas the latter is recognized as the external constraint. Much of the seminal theoretical literature on both these growth constraints ignores international food price inflation or food dependency, or both. However, the growing influence and importance of these phenomena in developing economies' growth processes makes it clear that they should be considered key sources of potential growth constraints.

One of the pioneers in drawing attention to how inflation could constrain growth was the Polish economist Michał Kalecki. The Kaleckian argument, developed in the early 1950s, was configured for a closed economy (perhaps because of the existence of domestic or international trade barriers, or both, at that time). Moreover, this closed economy is a developing one where food prices have a large weight in the CPI. In today's context, only the large weighting of food in the CPI still holds, as most developing economies are engaged in the globalization process; thus, it is unrealistic to think in terms of a closed economy. As is pointed out below, however, the main result of Kalecki's argument holds for an open developing economy (which we assume has a rigid domestic supply of food and is, therefore, food-dependent). By considering an open economy, furthermore, we are able to illustrate how the domestic growth constraint might be indirectly reinforced.

Kalecki put forward the idea that an economy that was expanding might face excessive inflationary pressures if supply in the primary sector, and that of foodstuffs in particular, was limited. More specifically, he argued that one important obstacle a developing economy might face

[3] As Wolf (2008) clearly puts it: "Growth is not everything. But it is the foundation for everything. The poorer the country the more important growth becomes, partly because it is impossible to redistribute nothing and partly because higher incomes make a huge difference to the welfare of the poorest." Moreover, rapid and sustained growth implies increasing aggregate demand, which is the primary source of firms' sales and profits.

when investment was increasing strongly was the difficulty of procuring an "adequate supply of necessities to cover the demand resulting from the increase in employment" (Kalecki, 1966, p. 16). If this supply is not adequate, inflationary pressures might be generated. In this sense, inflation, as Noyola (1956, p. 604) remarked, is chiefly "the result of real imbalances".[4] In other words, "the crucial point of whether a certain level of investment creates or does not create inflationary pressures is the possibility of expansion of supply of consumer goods in response to demand" (Kalecki, 1993b, pp. 25-26). If supply in the primary sector is indeed rigid, prices will increase, causing real wages to fall. Thereafter, "the reaction of workers to the reduction of real wages will be a demand for higher money wages, and thus a price-wage spiral will be initiated" (Kalecki, 1993b, p. 26). As can be seen, inflation for Kalecki is the result of a structural problem (a real imbalance), stemming from the limited productive capacity of the primary sector to satisfy a growing demand for food. An important point is that institutional and structural rigidities in the agricultural sector mean that relative and absolute rises in agricultural prices do not stimulate an adequate supply response.

The inflationary pressure resulting from a rigid food supply leads to constraints on growth via investment. Investment can be negatively affected through two different mechanisms. First, policymakers might decide to reduce aggregate demand in order to reduce the demand for food, with investment shrinking as a result (i.e., as a result of falling public investment, but also of shrinking public expenditure, which in turn reduces firms' sales). Second, monetary authorities in developed and developing economies alike generally have a strong belief that inflation is exclusively a monetary problem. To fight inflationary pressures, therefore, they apply conventional policies in the form of fiscal and monetary tightening. Both types of policies act by reining in private investment through their impact on effective demand, thus reducing actual and potential growth.[5]

In a context where inflation arises from a real imbalance, the cost of taming it by shrinking demand (merely in order to reduce the quantity of money) will be very high, since this implies a loss of output (and thus employment). At the same time, it is important to realize that the policy measures described are by no means guaranteed to put an end to inflation.[6]

In sum, under conditions where an economy is expanding and facing domestic supply shortages of food commodities, it is likely that growth will be constrained at some point. This outcome will be unavoidable when an economy is a net importer of food (that is, it is an open economy) and international food prices are rising (a scenario that, as we have emphasized, has been forecast to prevail for at least the next decade). Inflation occurs because food weighs heavily in the CPI in developing economies, as we have mentioned, making this very sensitive to international food price movements. Hence, any increase in international food prices will generate inflationary pressures (countries will in fact be "importing" inflation in this sense), inducing the authorities to tighten macroeconomic policy. In a scenario of food dependency and rising international food prices, therefore, any expansion of output will necessarily generate inflationary pressures (via higher employment, à la Kalecki, and via "imported" inflation) that give rise to a domestic growth constraint.[7] The economy will be unable to grow sustainably in consequence.

It could also be the case that international food price inflation might reinforce or give rise to the domestic growth constraint in food-dependent economies that are, paradoxically, not growing (in this context, or even under conditions of low growth, the demand for food tends to be very stable, rising only in line with increasing population), because the economy will merely "import" inflation. If growth is stagnating (or, even worse, is negative), the sort of conventional macroeconomic policies applied to fight inflation will aggravate the deterioration of the real economy. Additionally, as mentioned, since the source of inflation is a real imbalance (reflected in this case in "imported" inflation), it is unlikely to be controlled.

Food price inflation (due to either economic expansion or imported inflation, or both) may not just give rise to or reinforce the domestic growth constraint

[4] See Sunkel (1958) for the classic reference work acknowledging and providing evidence for the structural origins of inflation. See also Cardoso (1981) for a more recent study of this phenomenon.

[5] Tight monetary policy entails higher interest rates, which might also have a negative effect on investment by increasing firms' debt service.

[6] This was pointed out long ago by Kaldor, who remarked: "Western economists were slow to recognize this point [that fiscal and monetary policies had little to do with the persistence of inflation in some Latin American economies], with the result that the stabilization policies… urged by international organizations proved abortive in halting these inflations, though they frequently involved contractions in the level of production and employment" (1966, p. 61).

[7] Evidently, it could happen that international food prices decline at the same time as the food-dependent economy is expanding. In this case, the domestic growth constraint will not bite. Even if domestic food prices are declining, however, the current account could deteriorate as a result of the agricultural trade deficit. As we will see, this contributes to the materialization of the external demand growth constraint.

directly, but may also do so indirectly, in two related ways. First, international food price inflation implies a larger foreign-exchange requirement to cover a given amount of food imports. If the economy in question maintains an unsustainable current account deficit[8] and there is a shortage of foreign exchange, expectations of a future devaluation to correct the external imbalance will start growing. As is well known, expectations of currency depreciation feed inflation due to the expected increase in the cost of imported capital goods and other production inputs. In this scenario, workers will demand a nominal wage that takes into account not only the increase in food prices, but also other price increments. The resulting wage-price spiral could thus accelerate, producing much higher inflation, and the authorities might respond by applying tighter demand constraint measures, which affect output and growth accordingly.

Second, the increase in domestic inflation resulting from food price inflation will have a negative impact on the economy's international competitiveness. In other words, rising domestic inflation, other things being equal, will strengthen the real exchange rate. Domestic currency appreciation will worsen the current account because exports will decrease while imports will increase. If the resulting external deficit is unsustainable, agents will expect the government to devalue in order to correct it.[9] It is easy to deduce that this will trigger a process similar to the one just described, with severely constrained economic growth as the final outcome.

It is important to stress that food dependency has the potential to reinforce the external or balance-of-payments growth constraint, as initially proposed by Harrod (1933) and Prebisch (1982) but refined by Thirlwall (1979). The argument is that an economy will be compelled to correct an unsustainable current account deficit by shrinking domestic demand when such a deficit can no longer be externally financed or when exchange-rate adjustments do not suffice to rectify the external disequilibrium, or both. As is well known (see Keynes, 1936), and as we stressed earlier, changes in output (and employment) follow effective demand adjustments. An induced reduction in effective demand to correct the trade balance will therefore affect growth negatively. Likewise, an economy that is expanding faces a potential balance-of-payments growth constraint.

Much as with the domestic growth constraint theory, a key insight of the external demand growth constraint approach is that the current account deficit deteriorates as a consequence of economic expansion (assuming imports grow faster than exports).[10] For an economy that is food-dependent, any output expansion will therefore lead to a deterioration of the agricultural trade balance, which will potentially worsen the current account. With the current account deteriorating, growth will be constrained when policies to reduce aggregate demand are applied at any point. This being so, it is clear that food dependency contributes directly to the emergence of the balance-of-payments growth constraint.

To sum up, international food price inflation and food dependency represent a negative combination for growth, since they are a potent source of domestic demand and external growth constraints. If any of these constraints materialize, economic growth cannot be long sustained. However, in practice policymakers frequently respond more quickly to inflationary pressures than to current account deficits. This is often because policymakers are bound by inflation targeting frameworks and tend not to worry about external deficits so long as they are relatively small and can be financed. Furthermore, they expect (often wrongly) that exchange-rate adjustments will rectify the external deficit.[11] Given the predicted evolution of food price inflation over the coming decades, the question that naturally arises is how far this phenomenon will affect domestic inflation and thus give rise to the domestic growth constraint.

To shed light on this question, we use the Mexican economy as our case study. There are two reasons for this. First, Mexico is an economy in which food dependency has steadily increased since the mid-1980s, i.e., since the adoption of trade liberalization policies. Second, food still has a large weight in its CPI. Mexico's central bank has accordingly recognized that domestic inflation has been subjected to upward pressures since international food prices started to soar. This is despite the fact that economic growth in Mexico since the early 1980s has been, on average, low and unstable. This being so, as we

[8] The agricultural trade deficits obviously run by net food importers contribute to a worsening of the current account.

[9] If the currency depreciates, domestic inflation will clearly increase, adding to the domestic growth constraint.

[10] Not all economies that expand will face a current account deficit (a remarkable recent example here being the Chinese economy). The net trade balance, we must recall, depends ultimately on the income elasticities of imports and exports.

[11] Even if the Marshall-Lerner condition holds, there is no guarantee that currency depreciation will improve the trade balance (see, for example, Thirlwall, 2003), at least in the short term (see Harberger, 1950; Laursen and Metzler, 1950). Even if it does, it might lead to a severe loss of real output (see Krugman and Taylor, 1978).

argue above, the authorities' decision to fight inflation has constrained the expansion of output in the recent past and will continue to do so, without succeeding in taming inflation. We argue that the Mexican experience indicates that when the source of inflation is a real imbalance, fighting inflation by conventional means produces ineffective results and severe real costs in terms of output, employment.

We shall now estimate the expected long-term effects of food price inflation on Mexican inflation. First, though, we present a brief overview of Mexico's food dependency.

III

Mexico's dependency on imported food and its consumer price index

Nothing in the growth literature suggests that governments should neglect the primary sector as economies climb the ladder of development, for example by removing trade protection and reducing technological and financial support. Nor should increasing development imply a shift from growing self-sufficiency in food production to food dependency.[12] It is therefore surprising that Mexico's dependence on imported food started to increase steadily just about the time its per capita income reached its highest-ever level (around US$ 7,400 in real terms in the early 1980s). Furthermore, and just as surprisingly, Mexico's food dependency started to intensify even as per capita income stagnated over the course of the following decade.

Although it is not the main focus of this paper, it is important to mention that Mexico's growing food dependency can be traced to both declining government support for the primary sector and trade liberalization policies, sealed with the launch of NAFTA. The combined outcome of decreasing government support and the NAFTA-driven trade liberalization strategy has been an ever-growing gap between domestic food production and demand (with demand growth having been driven essentially by the rise in population).[13] This gap has been filled by rising imports of food, which have steadily increased food dependency.

Part of the reason for the stagnation of domestic food production after trade opening lies in the inability of domestic producers to compete with imports. Another reason, however, is that many farmers have shifted production towards more profitable products (see Calva, 2007). Additionally, trade liberalization hastened the abandonment of government support for the primary sector, a process that started during the early 1980s with the debt crisis and the adoption of International Monetary Fund (IMF) and World Bank stabilization and adjustment programmes. In effect, both public expenditure and investment to support the primary sector declined sharply: public expenditure of this type fell from 0.89% of GDP in 1990 to 0.57% in 1999, while public investment fell from 0.31% to 0.09% in the same period (Calva, 2001). Moreover, credit to the agricultural sector grew only weakly after 1990 even in nominal terms, and it has been decreasing since 1998.

Our earlier arguments are underscored by the fact that domestic production of five basic grains (beans, maize, wheat, sorghum and rice) increased by a negligible 4% from 1994 to 2005 while imports of these foodstuffs kept growing substantially (food imports increased by 66% from 1994 to 2005), and that Mexico has increasingly been an importer of food since the mid-1980s (see table 1).

[12] In fact, empirical evidence shows (and development theory implies, with the idea that primary sector exports should finance industrial imports during the early stages of development) that industrializing economies ought to deploy the necessary measures to guarantee food self-sufficiency and that, once industrialized, they should be able to continue exporting food commodities. In fact, Kaldor (1966) goes further in emphasizing the importance of the agricultural sector to the industrialization process by arguing that any successful industrialization strategy must be underpinned by the development and maintenance of an agricultural surplus, "…that is, the excess of food production over the food consumption of the food producers themselves" (p. 55).

[13] By contrast with other developing economies such as China and India, economic performance cannot explain Mexico's rising demand for imported food. During the 1985-2007 period, for example, Mexico's average output and per capita income growth rates were just 2.8% and 1.2%, respectively. The main explanation for Mexico's growing imports of food commodities, therefore, has been population growth coupled with the stagnation of domestic production, particularly since the early 1990s.

With domestic food output stagnant, little is being produced for external markets, whereas the demand for food imports has kept increasing. It is therefore not surprising that Mexico has been facing a chronic and ever growing agricultural trade deficit (see figure 1). Periods in which this account has recovered, i.e., gone into surplus, have been the result of severe constraints on demand to deal with economic crises. The agricultural trade deficit

TABLE 1

Mexico: domestic production and imports of food, 1985-2005
(Thousands of tonnes)

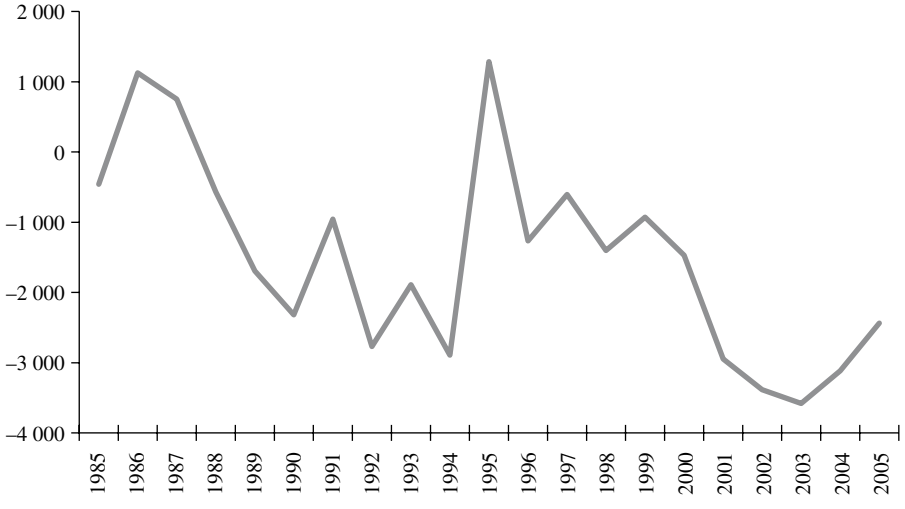
Year	Food imports[a]	Domestic food production[a]	Dependencyratio
1985	5 109.99	27 633.90	0.18
1986	2 889.23	23 144.90	0.12
1984	4 860.16	23 954.30	0.20
1988	5 683.10	21 469.90	0.26
1989	7 031.67	21 450.10	0.33
1990	7 783.27	26 226.30	0.30
1991	5 312.54	24 345.70	0.22
1992	7 368.63	27 015.60	0.27
1993	5 977.63	25 863.70	0.23
1994	7 987.05	27 825.60	0.29
1995	4 991.12	27 628.90	0.18
1996	10 283.33	29 953.80	0.34
1997	6 908.88	28 459.10	0.24
1998	11 402.73	29 883.40	0.38
1999	13 303.50	27 833.30	0.48
2000	13 796.98	28 131.70	0.49
2001	15 179.77	31 265.50	0.49
2002	15 278.69	29 516.20	0.52
2003	14 360.34	31 864.50	0.45
2004	12 999.98	32 453.30	0.40
2005	13 284.35	28 996.40	0.46

Source: ECLAC database (available at: www.eclac.cl).

[a] Includes five basic grains: beans, maize, wheat, sorghum and rice.

FIGURE 1

Mexico: agricultural trade balance, 1985-2005
(Millions of dollars)



Source: ECLAC online database (available at: www.eclac.cl).

has contributed to the overall current account deficit, which in turn has put pressure on the currency.

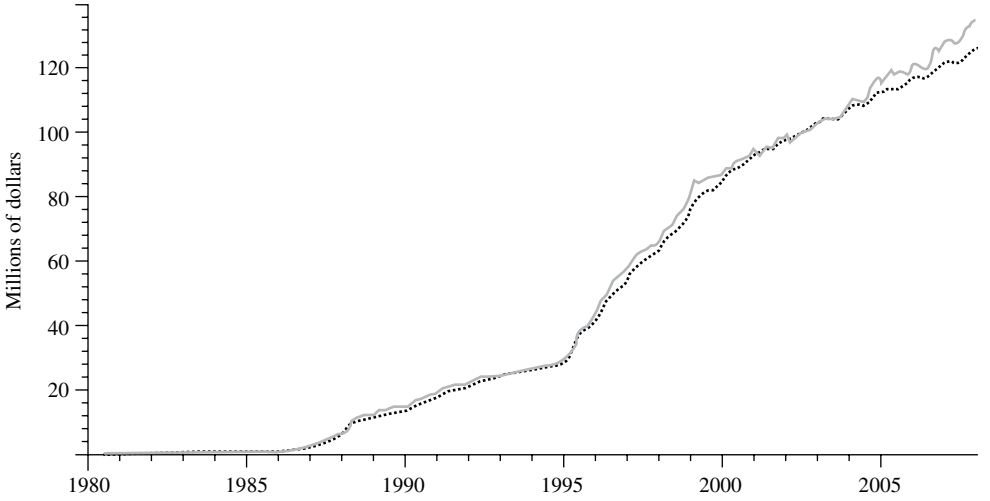
With the above in mind, it is important to stress that food is still extremely important in Mexico's CPI, accounting for around 22% of the index. Thus, variations in international food prices can clearly exercise a direct effect on the CPI. There might also be an indirect effect on inflation through the higher production costs implied for commodities which use food as an input. Thus, the influence of food on the CPI may in fact be larger than is suggested by its 22% weight in the index.

Figures 2 and 3 indicate that there is a strong positive link between food prices and the CPI, in both the short and long terms. This, coupled with food dependency, suggests that food price inflation might indeed have a significant impact on overall domestic inflation. In fact, Mexico's central bank has been arguing that international factors, in particular rising international food prices, have been the main cause of domestic inflation since 2001. At the same time, its measures to tame inflation have not deviated from the conventional approach that treats this as an exclusively monetary phenomenon (see *Informe Anual del Banco de México*, various issues). As a result, the fight against inflation in Mexico has had severe costs for real output. Seen from this perspective, inflation and the efforts to control it, irrespective of its monetary nature, have been turning into a structural problem. In this context, it is very likely that efforts to tame inflation by conventional means (i.e., tightening the money supply by reducing public expenditure and increasing the interest rate) will continue to have little or no effect on it, but will instead reduce economic growth, output and employment.

Given Mexico's increasing dependence on imported food and the expected continuation of food price inflation over the near term, it is important to ascertain quantitatively the degree to which food price inflation affects Mexico's CPI, thus giving rise to a domestic growth constraint. The next section sheds light on these issues by applying dynamic panel techniques.

FIGURE 2

Mexico: long-term link between food prices and the CPI, 1980-2005

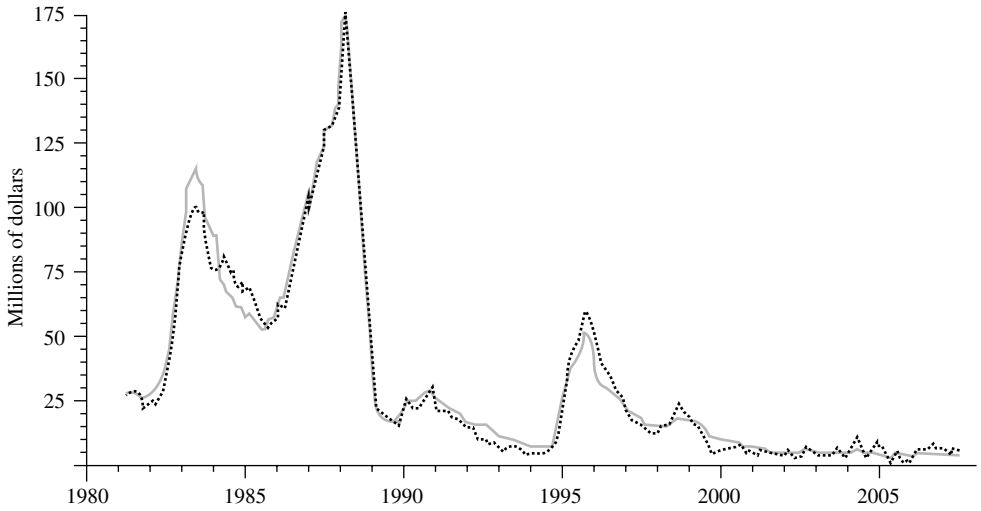


Source: Prepared by the authors on the basis of Bank of Mexico data (www.banxico.org.mex).
Note: Index, June 2002 = 100

Mexican consumer price index (dotted line).
Mexican food price index (solid line).

FIGURE 3

Mexico: short-term link between food prices and the CPI, 1980-2005



Source: Prepared by the authors on the basis of Bank of Mexico data (www.banxico.org.mex).
Note: Index, June 2002 = 100

Mexican consumer price index (solid line).
Mexican food price index (dotted line).

IV

Using dynamic models with panel data to estimate the long-term elasticity of food prices in Mexico's CPI

To determine the size of the impact that higher food prices might have on Mexico's CPI, we estimate a price equation using panel data for 1997-2004 in Mexico's 32 provinces, including the Federal District, and a set of different types of dynamic panel estimators. The estimators employed include the Anderson-Hsiao estimator (Anderson and Hsiao, 1981 and 1982), the Arellano-Bond generalized method of moments (GMM) estimator (Arellano and Bond, 1991) and its augmented version, the Arellano-Bover and Blunder-Bond system GMM estimators (Arellano and Bover, 1995; Blunder and Bond, 1998). The use of such estimators is appropriate in this context because prices are often modelled as dynamic processes and the ordinary least squares (OLS) and within-group estimators are both biased and inconsistent when used to estimate highly persistent data.

More specifically, determining whether international shocks to local commodity prices had a lasting impact on Mexico's CPI would involve the estimation of price equations that combined individual specific effects with dynamic effects. We estimate the following equation:

$$p_{i,t} = \delta p_{i,t-1} + x_{i,t}\beta + \alpha_i + u_{i,t} \qquad (1)$$

where $p_{i,t}$ stands for Mexico's CPI, α_i is an unobservable province-specific effect which is constant across time, $x_{i,t}$ is a vector of explanatory variables and $u_{i,t}$ is a random disturbance term. In other words, we estimate

an equation in which the CPI is the response variable, whereas the lagged CPI, money supply (M2), GDP, the nominal exchange rate and the prices of four basic grains (maize, wheat, sorghum and rice), plus those of meat (red and poultry) and milk, are the regressors.

Our model includes a lagged CPI, reflecting the fact that prices are often considered to be persistent phenomena. Money supply is a variable typically used in the price modelling literature (see Welsh, 2003; IMF, 1996), as it measures the extent to which inflation is a monetary phenomenon, particularly in the long term. We include GDP in our equation in order to measure the impact of demand on prices and the nominal exchange rate (NER) and to capture how inflation is affected by exchange-rate depreciations (recall that in our theoretical framework we mentioned that inflation feeds the exchange rate which, if devalued, in turn feeds back into inflation). The remaining variables are introduced to measure the effect of domestic food prices on the CPI and thus to identify the extent to which the evolution of prices might give rise to the domestic growth constraint. We assume that domestic food prices fully reflect the movements of food prices on international markets.

It is important to note that, from an econometric point of view, equation (1) is affected by two problems: (i) food prices, GDP and the nominal exchange rate are likely to be endogenous, given that they might be jointly determined with the CPI (simultaneity), which implies that these regressors may be correlated with the error term; and (ii) there is the possibility of unobserved province-specific effects correlated with the explanatory variables, including the lagged CPI. Thus, it seems desirable to control for such individual effects to obtain unbiased and consistent parameter estimates.

To obtain consistent estimates of the parameters of interest, a better approach would be to transform equation (1) by taking first differences of the data, thereby eliminating the problem of correlation between the lagged CPI and province-specific effects. Thus, the alternative specification to equation (1) would be:

$$\Delta p_{i,t} = \delta \Delta p_{i,t-1} + \Delta x_{i,t}\beta + \Delta u_{i,t} \qquad (2)$$

where the province-specific effects (α_i) have been eliminated, but, by construction, there is still correlation between the lagged first difference of the CPI and the error term. To purge this correlation, we can use the Anderson-Hsiao estimator (1981, 1982), which suggests we use either lags of the level of the CPI or lags of the first-differenced CPI ($p_{i,t-2}$ or $\Delta p_{i,t-2}$) as valid instruments. However, the Anderson-Hsiao estimator is inefficient because it does not use all the existing instruments. It can be improved by using the Arellano-Bond first-differenced GMM estimator, which uses the price equation (2) and all the orthogonality conditions that exist between lagged values of the CPI and the disturbances.

Nevertheless, the Arellano-Bond first-differenced GMM estimator is less efficient than the Arellano-Bover system GMM estimator, provided that the latter exploits additional moment conditions by combining the price equation in differences and levels within a single system. Each is provided with a specific set of instrumental variables, as follows:

$$\Delta p_{i,t} = \delta \Delta p_{i,t-1} + \Delta x_{i,t}\beta + \Delta u_{i,t} \qquad (3)$$

$$p_{i,t} = \delta p_{i,t-1} + x_{i,t}\beta + \alpha_i + u_{i,t} \qquad (4)$$

Equation (4) denotes the price data-generating process in levels, in which the province-specific effect is not eliminated but must be controlled for by the use of instrumental variables. This set-up is superior, then, because it exploits additional moment conditions and gives us substantial efficiency gains over the first-difference estimator. Although the dynamic panel estimators are an improvement over cross-sectional estimators, not all of them will perform equally well. To judge the reliability of our price equation estimations, it is advisable to carry out specification tests.

One such test is the so-called Sargan test of overidentifying restrictions, which allows us to ensure the validity of the instruments by analysing the sample counterparts of the moment conditions used in the estimation process. Another important specification test is the serial correlation test. This test verifies whether the residual of the regression in differences is first- or second-order serially correlated. We expect the differenced residuals to be first-order serially correlated, unless they follow a random walk. However, we also expect to find that such residuals are not second-order serially correlated, allowing us to ensure the validity of the instruments postulated.

We now consider the estimation of equation (2) using the three aforementioned dynamic panel estimators to ensure the robustness of our results. In table 2 we report dynamic panel estimates of the long-term elasticities resulting from the long-term static solution of our price equation.[14] The lagged dependent variables in

[14] For comparative purposes, in table A1 of the appendix we also report OLS and within estimates of the parameters, which are biased and inconsistent. It is worth mentioning that the OLS estimates are not very far from our dynamic panel estimates.

levels and first differences are used as instruments in the Anderson-Hsiao estimates in the first two columns. Column 3 shows the Arellano-Bond GMM estimates, where the money supply (M2) is treated as strictly exogenous and all the other explanatory variables and their lags are used as instruments. Column 4 shows the system GMM estimates, where money supply is treated as exogenous and the rest of the explanatory variables and their lags (predetermined variables) are included as instruments. The instruments we use passed the Sargan tests and the AR(1) and AR(2) tests for autocorrelation.

As can be seen in table 2, all variables are statistically significant and the estimated results from the different panel data techniques are similar. They all confirm that, as expected, food prices will have a large influence on the CPI in the long term. Due to the fact that the system GMM estimates are more efficient than the Anderson-Hsiao estimates, we use the former estimated parameters to draw inferences.

The first point to make is that, on the face of it, one could argue that the CPI will not be significantly affected by international food price movements because the

TABLE 2

Mexico: Long-term elasticities of the CPI to the money supply, GDP, NER and food prices

Independent variable	Anderson-Hsiao (instrumenting differences)	Anderson-Hsiao (instrumenting levels)	DIF-GMM (instrumenting prices, GDP and NER[a])	SYS-GMM (Instrumenting prices, GDP and NER[a])
M2	0.1686	0.1597	0.0658	0.1291
	(0.0028)	(0.0023)	(0.0000)	(0.0000)
GDP	0.0398	0.0383	0.0166	0.0306
	(0.0004)	(0.0004)	(0.0000)	(0.0000)
NER	0.0411	0.0399	0.0345	0.0601
	(0.0005)	(0.0005)	(0.0000)	(0.0000)
Maize	0.0343	0.0329	0.0050	0.0548
	(0.0004)	(0.0004)	(0.0000)	(0.0000)
Wheat	0.0567	0.0554	0.0219	0.0573
	(0.0011)	(0.0011)	(0.0000)	(0.0000)
Sorghum	0.0353	0.0339	0.0142	0.0537
	(0.0006)	(0.0006)	(0.0000)	(0.0000)
Milk	0.0283	0.0276	0.0200	0.01598
	(0.0003)	(0.0003)	(0.0000)	(0.0000)
Poultry	0.0256	0.0245	0.0220	0.0196
	(0.0003)	(0.0003)	(0.0000)	(0.0000)
Red meat	0.0348	0.0338	0.0246	0.0337
	(0.0003)	(0.0004)	(0.0000)	(0.0000)
Rice	0.0205	0.0201	0.0092	0.0342
	(0.0003)	(0.0003)	(0.0000)	(0.0000)
Constant	0.1950	0.1832	0.1208	0.0040
	(0.0028)	(0.0026)	(0.0000)	(0.0000)
Wald (joint)	0.000 [21]	0.000 [20]	0.000 [29]	0.000 [29]
Wald (dummy)	0.000 [3]	0.000 [3]	0.000 [11]	0.000 [12]
Wald (time)	0.000 [3]	0.000 [3]	0.000 [3]	0.000 [3]
Sargan test	-	-	0.999 [94]	0.999 [193]
First-order autocorrelation test AR(2)	0.559	0.570	0.022	0.928
First-order autocorrelation test AR(1)	0.682	0.738	0.049	0.013
No. of observations	27	27	46	46

Source: Prepared by the authors on the basis of Bank of Mexico data (www.banxico.org.mex).

[a] A set of valid moment restrictions involving lagged prices, GDP and NER are exploited. Additional instruments used are the stacked levels and first differences of dependent variables and prices, GDP and NER.

Notes:
(i) M2 is the sum of the M1 monetary aggregate (currency in circulation + demand deposits in the banking system) and savings deposits.
(ii) Asymptotic standard errors robust to general cross-section and time series heteroskedasticity are reported in parentheses.
(iii) Time dummy variables are included in all equations.
(iv) We report the p-value, while the degrees of freedom are in parentheses.
(v) Anderson-Hsiao type equations are estimated using the third lag of the CPI as instrument.
(vi) The GMM estimates reported are all two-step.
(vii) DIF indicates that in the model, the variables are in differences; SYS indicates that he variables in the model are in levels.

elasticities associated with each food item are relatively low. However, this conclusion might be misleading. If grain prices continuously increase, for example, as forecast by the Organisation for Economic Co-operation and Development (OECD) and the Food and Agriculture Organization of the United Nations (FAO), then the sum of the elasticities of three basic grains (0.1658), namely, wheat, maize and sorghum (0.0573, 0.0548 and 0.0537, respectively), easily overwhelms the elasticity of the CPI with respect to changes in the money supply. This implies that an increase of 10% in the price of these food grains will push inflation up by 1.7%. This is by no means a negligible impact, and it shows that many of the inflationary pressures Mexico will face in future will be of a structural character. It means that inflation in Mexico is indeed quite sensitive to the prices of basic grains. Moreover, if the prices of several foodstuffs increase considerably at the same time then, in our case, the exercise of summing up the elasticities of our edible commodities more than doubles the response of the CPI to changes in the money supply. Thus, food prices will put considerable pressure on domestic inflation, and the domestic growth constraint is likely to materialize as a result. At the same time, other things being equal, the international competitiveness of exports is likely to be negatively affected by the rise in prices, leading to a deterioration in the current account that would feed back into inflationary pressures. If this occurs, policymakers are likely to fight inflation by conventional means, with a negative effect on growth.

Our findings, then, suggest that, given the country's dependence on imported food, Mexican inflation will turn into a largely structural problem (a real imbalance). Under these circumstances, it is very likely that the authorities will find it difficult to tame inflation with their conventional tools, and that these will negatively affect output and economic growth instead.

Another point worth noting is that the estimated long-term elasticity of the CPI to GDP is very low (0.0306), suggesting that expansionary policies can be applied without much risk of generating inflation. In particular, expansionary policies to support the primary sector and expand its production could be implemented without the risk of generating inflation.

The policy recommendation that derives from our estimates is that the best way to control inflation in the long term is to eliminate its structural component. Evidently, this cannot be done by imposing price controls or export restrictions or by further augmenting food imports. Neither can it be done by tightening the money supply or maintaining an overvalued exchange rate. These policy options, though real and feasible alternatives, will only solve the problem of food dependency and imported inflation on a short-term basis. The long-term policy solution to this problem consists in putting the primary sector on the agenda of national priorities, as developed nations have done (see Chang, 2009), providing support until a greater degree of food self-sufficiency is achieved. This can be done through several mechanisms, which include land (reform) policy; research, education and information policy; credit policy; inputs policy, such as canal irrigation, infrastructure, transport, marketing, processing and the use of price guarantees to maintain the stability of producers' incomes; warehousing; trade protection; insurance; and so on (see Calva, 2002; Chang, 2009). Kalecki (1954, p. 30) advocates the adoption of the policies suggested, stating that "the expansion of food production… is of paramount importance in avoiding inflationary pressures", particularly when economic expansion and industrial development are under way.

V

Conclusions

International food prices have soared since 2001 to unprecedented levels. Food price inflation is expected to persist in the near future as demand for food continues to overwhelm supply. Countries which are highly dependent on imported food commodities and where foods weigh heavily in the CPI are and will continue to be adversely affected in terms of their domestic inflation. This, in turn, will give rise to an inescapable domestic growth constraint. Mexico is an economy that lacks food self-sufficiency. It is also one in which food has a large weighting in the CPI (around 25%). Since the mid-1980s, food dependency has intensified, and domestic food production has stagnated. In this paper, we have used dynamic panel techniques to investigate the extent to which rising food prices influence Mexico's CPI and how that affects the materialization of the domestic growth constraint .

Our estimated long-term elasticities indicate that domestic prices will be severely affected by food price

inflation. In the long term, we have established that the responsiveness of the cpi to changes in food prices will be more than double its reaction to changes in the money supply. This indicates that the root of domestic inflation will be structural rather than monetary. In this context, monetary policy is likely to fail to control inflation if the agricultural price issue is not taken into account, instead placing further constraints on economic growth. Effective control of inflation should therefore prioritize the primary sector with the aim of restoring its supply capacity and enhancing self-sufficiency.

(Original: English)

APPENDIX

TABLE A1

Mexico: Long-term elasticities of the CPI to the money supply, GDP, NER and food prices

Independent variable	(1) OLS	(2) Within-group
M2	0.1190	0.7116
	(0.0000)	(0.0000)
GDP	0.0081	0.5553
	(0.0000)	(0.0000)
NER	0.0590	0.7377
	(0.0000)	(0.0000)
Maize	0.1335	1.0338
	(0.0000)	(0.0000)
Wheat	0.0328	0.9837
	(0.0000)	(0.0000)
Sorghum	0.0435	0.1327
	(0.0000)	(0.0000)
Milk	0.0057	0.6407
	(0.0000)	(0.0000)
Poultry	0.0433	0.4607
	(0.0000)	(0.0000)
Red meat	0.0219	-
	(0.0000)	
Rice	0.0289	1.7810
	(0.0000)	(0.0000)
Constant	0.0066	-
	(0.0000)	
Wald (joint)	0.000 [23]	0.000 [18]
Wald (dummy)	0.000 [14]	0.000 [6]
Wald (time)	0.000 [4]	0.000 [6]
First-order autocorrelation test AR(2)	0.003	0.964
First-order autocorrelation test AR(1)	0.003	0.095
No. of observations	46	65

Source: Prepared by the authors on the basis of Bank of Mexico data (www.banxico.org.mex).

Notes:
(i) M2 is the sum of the M1 monetary aggregate (currency in circulation + demand deposits in the banking system) and savings deposits.
(ii) Asymptotic standard errors robust to general cross-section and time series heteroskedasticity are reported in parentheses.
(iii) Time dummies are included in all equations.
(iv) We report the p-value, while the degrees of freedom are in parentheses.
(v) Column (1) reports OLS estimates of the equation in levels.
(vi) Column (2) reports within-group estimates. These are OLS estimates of the equation in deviations from time means.
(vii) CPI: consumer price index.
(viii) GDP: gross domestic product.
(ix) NER: nominal exchange rate.

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