Box 2
Economic Effects of Indexation and its Prevalence in Colombia

Automatic price adjustment mechanisms, known as indexing, have mainly been a relatively common practice in developing economies even under different macroeconomic environments. These mechanisms often arise spontaneously in agents' private contracts as a tool to protect themselves from high and unpredictable inflation. However, on other occasions they are the product of regulations resulting from various institutional arrangements. The economic effects of indexing have been a relatively active area of study and a subject of debate. This box presents a brief review of some of the effects of indexing documented in the specialized literature and quantifies the prevalence of its effect on consumer prices in Colombia.

The literature analyzing the economic impact of indexing is extensive[1] and highlights both the benefits and costs associated with it. As for the former, from the microeconomic point of view, when there are high inflation rates, indexing makes it possible to reduce uncertainty in the agents' contractual agreements (Lefort and Schmidt-Hebbel, 2002). In the labor market, this replaces the need for frequent wage renegotiations and reduces the transaction costs associated with such renegotiations (Gray, 1978; Aizenman, 1984, 1987). Furthermore, it enables a transfer of risk between workers and companies. This occurs because workers are more risk averse and are, therefore, willing to earn nominal wages that are temporarily lower than market wages if they know that they can count on a mechanism that will help them keep their purchasing power unchanged in the event of future inflationary shocks (Azariadis, 1978).

Regarding the costs of indexing, the main implications are important at the macroeconomic level, especially in terms of its effects on price stabilization policies. First, when current price adjustments are contingent on past variation, inflation acquires more inertia and becomes more persistent (Edwards and Lefort, 2002). Moreover, indexing amplifies the impact of a price increase that a particular subgroup of goods may suffer and spread it to the other indexed goods or services (Landerretche et al., 2002). For the monetary authorities, the aforementioned effects mean that indexing increases the cost of reducing inflation in terms of output, a conclusion that numerous studies agree on (Ball, 1994; Bonomo and García, 1994; Jadresic, 1996; Herrera, 2002).

That being the case, what is the balance between the benefits and costs of indexing? The consensus in the literature is that for a country that reaches moderate or low inflation rates, the cost-benefit of indexing becomes unfavorable since the benefits of indexing are diluted while its costs increase (Lefort and Schmidt-Hebbel, 2002). In the current context of the Colombian economy, this conclusion is relevant. In Colombia, after having reached a low inflation regime, a combination of foreign and domestic shocks of different natures along with a rapid recovery of demand gave rise to the post-pandemic inflationary outbreak (for a detailed discussion of its determinants see Pulido et al., 2023; or Toro, 2023). Therefore, the process of adjusting inflation to its target that the Colombian economy is currently undergoing could be longer and more costly as indexing becomes more widespread in the economy.

In order to analyze the extent of indexing in the prices of goods and services in Colombia, the Bank's technical staff did an exploratory exercise. This consisted of selecting those items from the consumer price index (CPI) where the prices were strongly influenced by the previous year's inflation (especially the total year-end inflation) and/or by the change in the legal minimum wage (LMW) for the current year which, in turn, is adjusted to at least the total inflation for the end of the previous year by regulation. The selection was made based

1 See, for example, Landerretche's et al summary (2002).

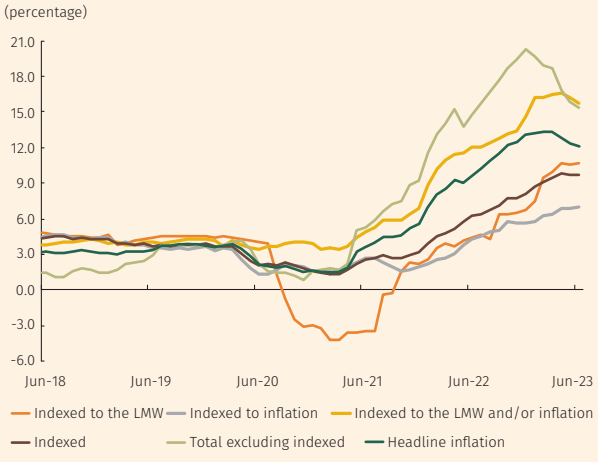
on the cost structure of each item as inferred from the supply-use matrices, the review of the regulations governing price increases for some CPI items, different statistical analyses, the results obtained from specialized literature (Arango et al., 2011; González-Molano et al., 2020) and, finally, the criteria of the technical staff.

Based on the selection of these items, a sub-basket called "indexed CPI" was constructed.[2] This contains 49 of the 188 items that make up the total CPI and account for 59.9% of that CPI. These items include 12 with prices that are adjusted by regulations and are therefore highly rigid. These have a weighting of 13.4% in the total CPI. The high participation of the indexed CPI sub-basket indicates that indexing has a significant impact on Colombian inflation. The selected items were also divided based on the main determinant of the price adjustments (past inflation, the LMW or both factors). The sub-basket of those indexed to past inflation is made up of 17 items with a 39.0% share in the total CPI and contains items such as rent, some utilities, school education, etc. The LMW-indexed sub-basket, in turn, is made up of 16 items including services related to co-ownership (building management), non-school education and personal services, such as beauty salons, day care centers, domestic services, etc. and accounts for 6.5% of the total CPI. Finally, the sub-basket indexed to both past inflation and the LMW includes 16 items such as eating out, some medical and veterinary services, public transportation, etc. and represents 14.4% of the total CPI.[3] Graph B2.1 shows the recent trend in the annual inflation of these CPI sub-baskets. There it can be seen that, as of June, they still do not show clear signs of a break like the CPI that excludes indexed items does. Thus, higher persistence of the first prices was evident in the post-pandemic inflationary outbreak.

That said, indexing in Colombia affects not only the goods and services markets, but also the labor market in particular. Specifically, the LMW in Colombia has a wide coverage in the distribution of formal sector wages (Arango et al., 2022; Pulido et al., 2023). As was mentioned, annual adjustments to the LMW cannot, by regulation, be less than the total inflation seen at the end of the previous year and generally also consider the growth of the previous year's Total Factor Productivity (TFP). The literature recognizes that this type of wage indexing rule introduces additional inefficiencies since it is based solely on aggregates and neglects heterogeneities in productivity, whether at the sectoral level (Duca and VanHoose, 1991) or among specific groups of workers (Kovanen, 1992). These inefficiencies arise because these rules raise unit labor costs to a greater extent in those sectors or for groups with lower productivity growth. This is counterproductive if, for example, the sectors with the lowest productivity growth coincide with those with the most prevalent informality as was the case in Colombia in 2022 (Graph B2.2). This implies that higher increases in unit labor costs in these sectors generate pressure for further increases in informality.

In conclusion, the literature has documented the fact that, though there are some benefits to indexing, they occur in contexts of high

Graph B2.1
CPI of Index-linked Sub-baskets
(annual change)

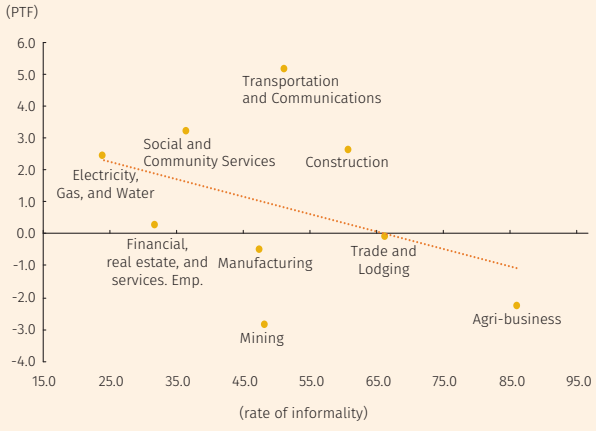


Source: DANE, calculations by *Banco de la República*.

2 This classification is for internal use at *Banco de la República* and supplements those published by the Bank and DANE but is not intended to replace them.

3 Note that the above exercise does not indicate that the selected items are completely adjusted to the aforementioned benchmark, but rather that the benchmark has a high share in the price formation mechanism of the respective item. Otros factores pueden influenciar los ajustes de precios (choques de demanda, de costos, tipo de cambio, etc.).

Graph B2.2
Growth in Total Factor Productivity (TFP) and Informality Rate in 2022



Note: the informality rate uses the definition of social security contribution.
Source: DANE (GEIH and national accounts), calculations by *Banco de la República.*

inflation and low predictability. In general, once a country has reached a moderate or low inflation regime, the costs of indexing outweigh the benefits. Specifically, a high prevalence of indexing increases the risk that the process of inflation convergence towards the target will be more prolonged and costly after inflationary shocks such as those experienced by the Colombian economy after the pandemic. In Colombia, evidence indicates that indexing has a significant impact on both the goods and services markets and the labor market, so the likelihood of such risks materializing is not negligible.

References

Aizenman, J. (1984). "Optimal Wage Re-negotiation in a Closed and Open Economy," *Journal of Monetary Economics*, vol. 13, no. 2, pp. 251-62.

Aizenman, J. (1987). "Wage Indexation," *The New Palgrave Dictionary of Economics*, London: Palgrave Macmillan.

Arango, L. E.; Ardila, L. K.; Gómez, M. I. (2011). "Efecto del cambio del salario mínimo en el precio de las comidas fuera del hogar en Colombia," Chapter in: López, E.; Ramírez, M. T. (ed.), "Formación de precios y salarios en Colombia," vol. 2, pp. 873-918, *Banco de la República* de Colombia.

Arango, L. E. (ed.) *et al*. (2022). "Efectos macroeconómicos del salario mínimo en Colombia," *Ensayos sobre Política Económica*, no. 103, *Banco de la República* de Colombia.

Azariadis, C. (1978). "Escalation Clauses and the allocation of Cyclical Risks," *Journal of Economic Theory*, vol. 18, no. 1, pp. 119-155.

Ball, L. (1994). "Credible Disinflation with Staggered Price-Setting," *American Economic Review*, vol. 84, no. 1, pp. 282-289.

Bonomo, M.; Garcia, R. (1994). "Indexation, Staggering and Disinflation," *Journal of Economic Surveys*, vol. 43, no. 1, pp. 39- 58.

Duca, J. V.; VanHoose, D. D. (1991). "Optimal Wage Indexation in a Multisector Economy,"*International Economic Review*, pp. 859-867.

Edwards, S.; Lefort, F. (2002). "Stabilization, Persistence, and Inflationary Convergence: a comparative analysis," in F. Lefort and K. Schmidt-Hebbel (eds). *Indexation, Inflation, and Monetary Policy*, pp. 65-104, Santiago, Chile, Central Bank of Chile.

González-Molano, E. R.; Hernández-Ortega, R.; Caicedo-García, E.; Martínez-Cortés, N.; Romero, J. V.; Grajales-Olarte, A. (2020). "Nueva clasificación del Banrep de la canasta del IPC y revisión de las medidas de inflación básica en Colombia," Borradores de Economía, no. 1122, *Banco de la República*.

Gray, J. A. (1978). "On Indexation and Contract Length," *Journal of Political Economy*, vol. 86, no. 1, pp. 1-18.

Herrera, L. O. (2002). "Indexation, Inflationary Inertia and the Sacrifice Coefficient" in F. Lefort and K. Schmidt-Hebbel (eds). *Indexation, Inflation, and Monetary Policy*, pp. 183-206, Santiago, Chile, Central Bank of Chile.

Jadresic, E. (1996). "Wage Indexation and the Cost of Disinflation," IMF Staff Papers vol. 43, no. 4, pp. 796-825.

Kovanen, A. (1992). "The Heterogeneity of Labor, Wage Indexation and Welfare," *European Economic Review*, vol. 36, no. 1, pp. 37-49.

Landerretche, O.; Lefort, F.; Valdés, R. (2002). "Causes and Consequences of Indexation: A Review of the Literature," in F. Lefort and K. Schmidt-Hebbel (eds). *Indexation, Inflation, and Monetary Policy*. pp. 19-64, Santiago, Chile, Central Bank of Chile.

Lefort, F.; Schmidt-Hebbel, K. (2002). "Indexation, Inflation, and Monetary Policy: An Overview," in F. Lefort and K.Schmidt-Hebbel (eds). *Indexation, Inflation, and Monetary Policy*, pp. 1-17, Santiago, Chile, Central Bank of Chile.

Pulido, J.; Vargas-Herrera, H.; Ospina-Tejeiro, J. J. (2023). "The Labor Market in Colombia: Structural Features and the Role of Wages in the Post-pandemic Inflationary Surge," Borradores de Economía 1232, *Banco de la República*.

Toro, J. (ed). (2023). "Determinantes del brote inflacionario postpandemia" Blog Banrep, July 10, available at: https://www.banrep.gov.co/es/blog/determinantes-brote-inflacionario-postpandemia