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Working Paper

The effect of natural gas shortages on the Mexican economy

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N° 2016-10

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June 2016

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Documento de Investigación
2016-10

Working Paper
2016-10

The Effect of Natural Gas Shortages on the Mexican Economy*

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Abstract: The Mexican economy experienced a shortage of natural gas from the second quarter of 2012 through the second half of 2013. In order to deal with this problem, the state-owned national supplier of natural gas (Pemex) implemented a system that restricts the amount of natural gas used by the manufacturing sector. With this information, we have constructed a "shortage index" that represents the percentage of natural gas restricted per month in each region. We quantify the effect of natural gas shortages on the manufacturing sector and the GDP using a panel data model with state and time fixed effects. We estimate that the natural gas shortage reduced the Mexican GDP annual growth rate by 0.28 percentage points in the second quarter of 2013.
Keywords: Public Economy
JEL Classification: D24, H40, O14

Resumen: La economía mexicana experimentó desabasto de gas natural desde el segundo trimestre de 2012 hasta la segunda mitad de 2013. Con el fin de mitigar este problema, la empresa paraestatal que provee gas natural a nivel nacional (Pemex) implementó un sistema que restringe las cantidades de gas natural utilizadas por el sector manufacturero. Con esta información construimos un "índice de desabasto" que representa el porcentaje de gas natural que fue restringido por mes en cada región. Cuantificamos el efecto del desabasto de gas sobre el sector manufacturero y el PIB usando un modelo panel de efectos fijos de estado y tiempo. Estimamos que el desabasto de gas natural redujo la tasa anual de crecimiento del PIB mexicano en 0.28 puntos porcentuales en el segundo trimestre de 2013.
Palabras Clave: Economía Pública

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1. Introduction

Natural Gas is an important input in many manufacturing industries, therefore shortages can disrupt production and reduce production levels. If such shortages are widespread, the problem can affect aggregate production levels. Unexpected shortages also affect the capability of the firms to react to the problem and exacerbate the adverse effects. Gas shortages affect manufacturing sectors in different ways: those that are more intensive in the use of natural gas, such as fabricated metals and machinery experience greater disruption (for detailed energy intensive sectors see the US Conference of Mayors, 2013). In this paper we estimate the effect of natural gas shortages on the manufacturing sector and on the economy.

To our knowledge, this is the first study that evaluates the economic impact of a particular episode of natural gas shortage. However, there is related literature that studies gas shortages. Barril and Bargas (2015) explore the reasons behind the natural gas outages in the Argentinian economy in the first decade of the 2000s. They estimate a production function from a panel of regions and conclude that the government's price policy discouraged investment and production of natural gas in Argentina. Similarly, MacAvoy (1970) and MacAvoy and Pindyck (1973) study natural gas shortages in the United States in the late 1960s. They focus their analysis on exploration and production of natural gas and conclude that these shortages were the consequence of a poor pricing policy implemented by the Federal Power Commission's Bureau of Natural Gas. Leahy et.al (2012) estimated the hypothetical impact of natural gas shortages on the Irish economy. The authors use a static accounting approach to estimate the potential effect of these shortages on production. From the national account input-output matrix they obtain the amount of natural gas as a proportion of the total inputs of each sector, and multiply it by the sector's participation in the GDP. The main disadvantage of this approach is that supply chain linkages between industrial sectors mean that a halt to production in one sector can have an adverse effect on production in another, which can lead to underestimation of the shortage effect. Another potential problem is that the continuation of productive, though limited activity, during outage and the possibility of subsequently recovered production can lead to overestimations (see Frayer, Keane and Ng, 2013).

In this study we estimate the effect of natural gas shortages on the manufacturing sector using a fixed effects model that includes a measure of the shortage as an independent variable, as well as other determinants of production. We obtain the total effect of gas shortages on the Mexican GDP by estimating second-round effects of the manufacturing sector on other economic sectors. This allows us to control for particular state features (both observable and unobservable) which do not change over time and could affect the dependent variable and the variables of interest. The panel characteristics of the data also allow us to capture the possibility of subsequently recovered production to compensate for production losses during the outage. The results suggest that in the absence of a natural gas shortage, the quarterly seasonally adjusted growth rate of the GDP in the second quarter of 2013 could have been -0.27 percent, rather than the observed -0.55 percent. Thus, the shortage problem can explain an important part of the decline in GDP during this quarter.

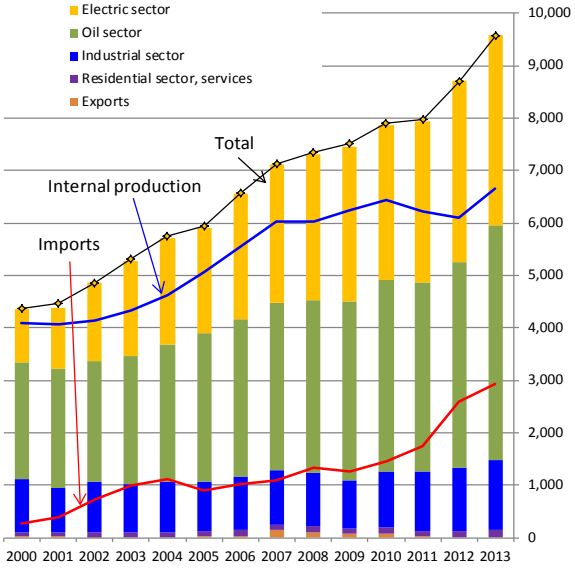
2. Natural Gas in Mexico

Shale gas has experienced a remarkable boom in the United States in the last decade. In 2000, it represented only 1.6 percent of total natural gas production in that country. Production jumped to 4.1 percent by 2005 and to 23.1 percent by 2010. This "energy revolution" reduced the price of natural gas in the U.S.: the price fell from 7.7 to 3.8 dollars per thousand cubic feet from 2007 to 2012. A natural gas pipeline infrastructure connecting Mexico to the US network allows it to import natural gas from its northern neighbor at a relatively low cost. Thus the Mexican prices' trajectory mirrored that of the US. Since the price reduction seemed permanent[1], many firms in Mexico switched to natural gas as a source of energy, and demand increased sharply (see Figure 1).[2]

[1] The futures of US natural gas suggest this. Additionally, according to the US Energy Information Administration (EIA, 2010), the probability of the price falling below the present price is greater than 50 percent.

[2] The ability to switch among fuels varies widely across the manufacturing sector. The production process of nitrogenous fertilizer is able to substitute for less than 1 percent of its natural gas use. On the other hand, the production of plastics and rubber products can switch nearly 40 percent of their fuel source (U.S. Energy Information Administration, 2013).

Figure 1
Natural Gas Demand, Production and Imports
Millions of cubic feet per day



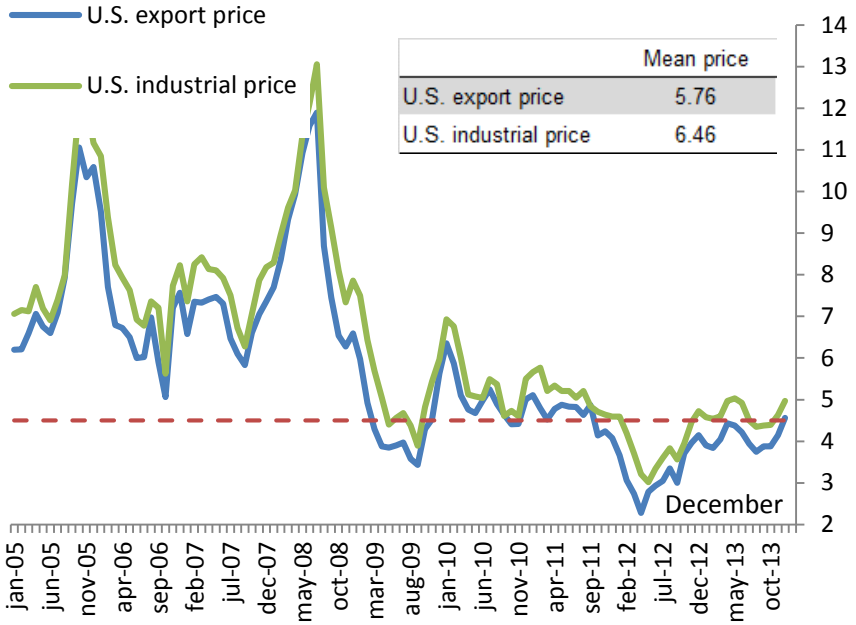
Source: Secretaría de Energía, Natural Gas National Balance, 2026 scenario.

Despite geological similarities between Mexico and the United States the Mexican state oil monopoly, Pemex, did not take advantage of shale gas exploitation. Energy regulations prior to Mexico's recent energy reform did not allow companies other than Pemex to exploit hydrocarbons or their derivatives.[3] Shale gas production requires small-scale production companies (Wang and Krupnick, 2013; Critchlow and Apte, 2012). Given Pemex's large scale-production, it is not surprising it continues focused on oil, extracting gas mainly as a by-product. Another problem is that the government price-setting mechanism seems to underestimate the real market price of gas by not fully accounting for transportation costs and investment required to increase pipeline infrastructure to import natural gas from the US (Secretaría de Energía, 2012).[4]. This underestimation had two effects on the energy market in Mexico. First, it provided further stimulus to demand growth and, second, with the

[3] Mexican petroleum law: *Ley Reglamentaria del Artículo 27 Constitucional en el ramo del Petróleo*. The secondary laws of the energy reform that allow private investment in this sector were promulgated in August 2014.
[4] *Secretaría de Energía* (2012) sets the new guidelines for setting natural gas prices and recognizes that the previous mechanism systematically underestimated the prices.

prevailing low price it was even less profitable for Pemex to invest in natural gas transportation or production infrastructure (Comisión Nacional de Hidrocarburos, CNH 2012).[5] As a result, the increasing use of pipelines to import natural gas from the US was not matched with more investment in infrastructure. Finally, the system became saturated in the second half of 2012, and the manufacturing sector experienced shortages from April 2012 until July 2013.

Figure 2
Natural Gas Prices
Dollars per thousand cubic feet



Source: EAI, CNH.

In order to deal with shortage problems in the short run, Pemex implemented a system of "critical alerts" which consisted of asking firms from particular states to limit their natural

[5] The CNH technical document evaluates possible investments according to the hydrocarbon reserves of January 2012 and ranks projects according to their profitability. The evaluation of natural gas investments uses a price of 4.5 dollars per thousand cubic feet of natural gas. This price is relatively close to the US export price observed during the last months of 2011, but it seems low compared to the historical path levels, and is below the mean both US export and US industrial prices. This argument takes on greater cogency when we consider that private investment in natural gas transportation infrastructure has been allowed in Mexico since the energy reform of 1995, yet private investment in this sector has been virtually zero since then. It seems that the problem persists: "Los Ramones" investment tender project, one of the most important in the natural gas industry, was declared deserted by Pemex in 2013 after private investors showed little interest. Pemex announced that it will continue with the project with public resources. In 2015, Pemex announced that BlackRock and First Reserve will participate with only the 45 percent of the total investment required to complete the project.

gas consumption for a period of time by a fraction of their historical consumption (Pemex, 2013). This measure reduced the availability of natural gas and affected the productive capacity of the manufacturing industry, and thus, the level of economic activity as a whole.

3. Data and Descriptive Analysis

The main independent variable is an indicator of the degree of natural gas shortage that was elaborated with data from Pemex and the Concamin's Energy Commission. This indicator varies over time and by state according to the following formula:

$$D_{it} = percentage_{it} * \frac{number\ of\ days_{it}}{30}$$

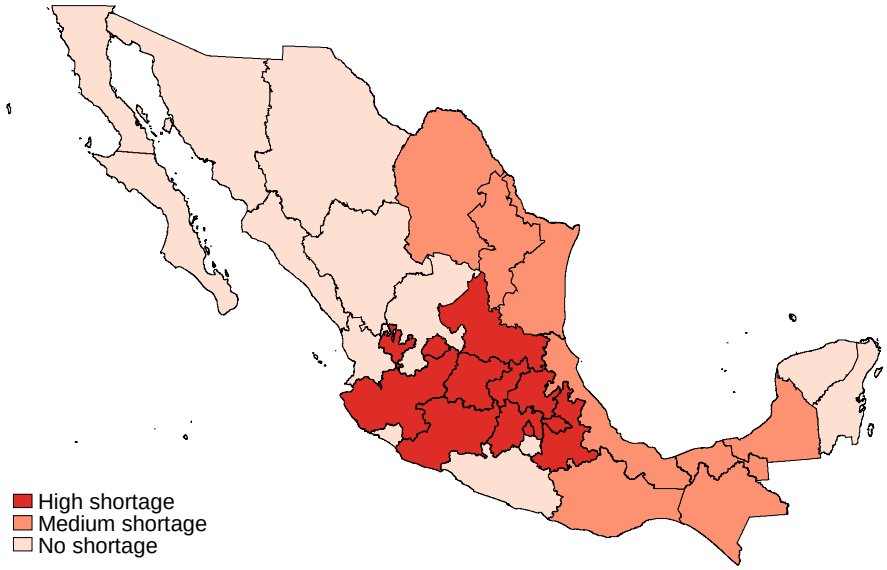
where *percentage* is the percentage of reduction in month *t* respect to historical consumption of natural gas in state *i* and $number\ of\ days$ is the number of days that the reduction is in force. For example, if natural gas use was rationed to 10 percent less than the historical consumption over 5 days in a month of 30 days, the indicator takes the value of 0.016 (10 percent multiplied by 5 days divided by 30 days).[6] Therefore, this index goes from 0 that indicates no shortage in a particular month, to 1 that means total halt in gas supply during one month. We use the state-level manufacturing index from Mexico and also include the US industrial production index both variables are obtained from INEGI database (Banco de Information Económica, BIE).

Natural gas shortages did not affect regions in Mexico evenly. Figure 3 presents the average level of shortage per region. The most affected regions were the center and mid-west. In contrast, the northwestern region suffered no shortage. According to the Energy Ministry, the center and mid-west were affected by bottlenecks in the pipeline infrastructure for importation and distribution from the US (Secretaría de Energía, 2012). The northern region, which is closer to the source of the imported natural gas, experienced no serious problems. Shortages were not evenly distributed over time either. Figure 4 shows the distribution of the

[6] Instead of dividing the number of days with shortage by 30, an alternative would be to use the number of business days per month, it is important to underline that the number of days chosen to construct the index has no effect on the results presented in this paper.

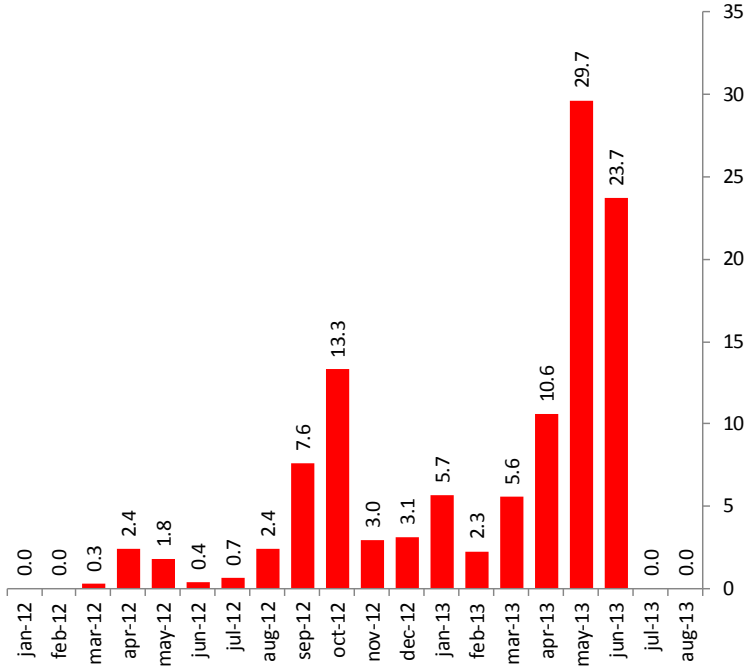
average shortage index over in time. It is noteworthy that there was a spike in September and October of 2012, whereas the greatest rationing was registered in the second quarter of 2013. After the third quarter of that year no new critical alerts were issued. We exploit this geographical and temporal variation in outages to identify the effects of natural gas shortages on the economy.

Figure 3
Mexican States by Level of Natural Gas Shortage



Source: Authors' elaboration with data from Concamin. We obtained the level of natural gas shortage by region using data from Concamin. The center and the mid-west are high shortage regions, south and northeast regions are medium shortage regions, and the north as well as states without access to natural gas are regions with no shortage. The high shortage region includes states that have an average shortage index above the mean of the distribution for states that experimented gas shortages.

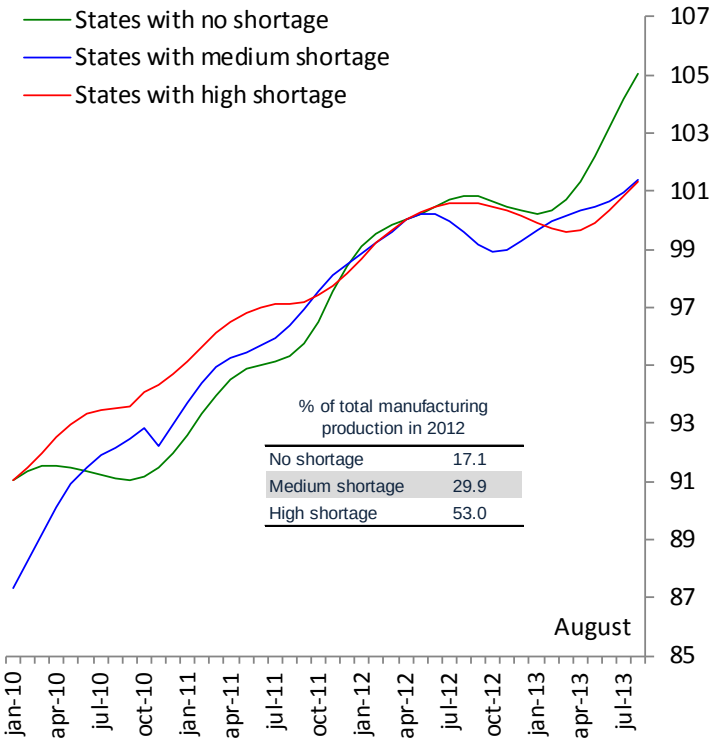
Figure 4
Average State Shortage Index
Percent



Source: Authors' elaboration with data from Concamin.

Descriptive evidence suggests that natural gas shortages seem to have affected manufacturing production. Figure 5 shows the relation between the natural gas shortage and manufacturing production for the three groups of states: high shortage, medium shortage, and no shortage. The states with high and medium shortage registered a more pronounced slowdown beginning in the second half of 2012, and they did not recover in 2013. In contrast, states with no shortages, showed a positive trend during 2013. It should be noted that the high shortage group has the highest share of total manufacturing production.

Figure 5
Manufacturing Production
Index Apr-2012 = 100
Trend Series



Source: Authors' elaboration with data from Concamin and INEGI.
Note: We used state manufacturing GDP of 2011 to calculate the level of manufacturing production by state. In order to obtain the production level over time, we used the monthly change from the manufacturing production index by state published by INEGI. The index is the sum of states' production that belong to each group. The level of natural gas shortage was determined by region using data from Concamin: center and mid-west are high shortage regions, south and northeast are medium shortage, and northern states as well as states without access to natural gas correspond to the regions with no shortage.

4. Econometric Analysis

We used monthly state-level panel data from January 2010 to August 2013 to estimate a fixed effects model with the logarithm of the monthly manufacturing production index as the dependent variable and the shortage index as the main independent variable:

$$\ln(y_{it}) = \phi D_{it} + \boldsymbol{\beta} ln(ipius_t)\pi_i + \boldsymbol{\gamma}\pi_i + \boldsymbol{\delta} T_s + u_{it} \,,$$

where

y_{it} is the seasonally adjusted manufacturing production index of state i in month t;
D_{it} is the measure of natural gas shortage;
$ipius_t$ is the seasonally adjusted industrial production index in the U.S.;
π_i are the state fixed effects;
T_s are the monthly seasonal fixed effects; and
u_{it} is the error term.

The inclusion of fixed state effects allows us to control for particular state features (both observable and unobservable) which do not change over time and which could affect the variables of interest and the independent variable. For example, states characterized by inferior infrastructure could generally be more prone to shortages and lower industrial production. Given that the level of infrastructure hardly changes during the time span of this study, heterogeneity in infrastructure among states is captured in the state fixed effects and will not bias the results. Gas shortages are by nature unexpected lending support to the exogeneity of our main dependent variable. In addition, we control for the important seasonal differences in demand for natural gas with monthly seasonal dummy variables, as has been done in other studies (Egging and Gabriel, 2006, and Rogel-Salazar and Sapsford, 2013, among others). Taking into account the influence of the US industrial activity on the Mexican manufacturing production, we control for the US industrial production index (Ipius). We interact this variable with a state dummy variable in order to account for the stronger link between the US and northern states than the rest of the country.

In order to verify the robustness of the results and choose the preferred estimation, we test the convenience of including different explanatory variables. In Table 1 we present the results for three specifications: (1) includes the logarithm of the Ipius interacted with a dummy variable by state and state fixed effects; (2) adds a trend variable; and (3) replaces the trend variable with monthly seasonal effect.

To evaluate the different specifications, we performed a linear hypothesis test (Wald test) on the parameters of the added control variables to verify whether their coefficients are jointly statistically different from zero. In specification (2) the trend variable is not statistically different from zero, while in specification (3), we can not reject the hypothesis that all the monthly seasonally coefficients are different from zero at a 5 percent confidence level, making (3) our preferred specification.

Table 1
Effect of Natural Gas Shortages on Manufacturing Production
Estimation

	ln (manufacturing production)		
	(1)	(2)	(3)
Shortage	-0.025**	-0.027**	-0.032**
	(-0.012)	(-0.012)	(-0.013)
Trend		0.0002	
		(0.0009)	
$ln(ipius_t)\,\pi_i$	✓	✓	✓
State fixed effects	✓	✓	✓
Monthly seasonal effects	✖	✖	✓
Cluster standard errors by state	✓	✓	✓
Number of observations	1,408	1,408	1,408
R-squared	0.826	0.826	0.827

Cluster robust standard errors by state in parentheses.
Significance level: *** 1%, ** 5%, * 10%.

Source: Authors' estimates with data from INEGI

4.1 Regression Results

As expected, the coefficient of the shortage index is negative and statistically different from zero in all the proposed specifications. Given that natural gas is an input for the production process in the manufacturing industry, an exogenous shortage of gas induces a lower output.

According to our preferred specification (3), an increase of 10 percent of shortage reduces the manufacturing production by 0.32 percent.[7]

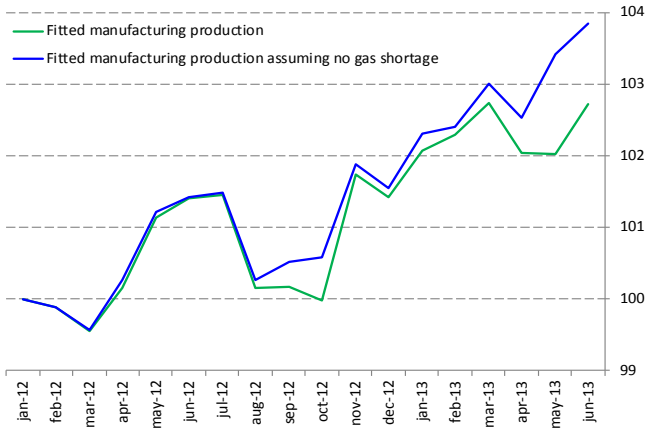
4.2 Quantifying the Effects of the Natural Gas Shortages on the Mexican Economy

The Mexican National Institute of Statistics and Geography (INEGI) publishes the level of manufacturing production by state once a year. Monthly manufacturing production data by state is available only in index format. We thus had to recover the level of monthly manufacturing production by state. We used the level of the state manufacturing production in 2012. Then, with the monthly index growth rate obtained by the fitted series from the model, both with and without shortage, we constructed a monthly manufacturing production level by state. Finally, by adding the production of each state, we obtained the aggregate fitted production with and without gas shortages. Results are presented in Figure 6. The difference between the fitted production with the observed gas shortage and the fitted production assuming no shortage represents the loss of production as a consequence of the natural gas shortage. These results indicate that the greatest impact of the shortage took place in the second quarter of 2013.

[7] There are two reasons why the shortage index may vary: 1) by changes in the period of time of the shortage or, 2) by changes in the percentage of the shortage. The relationship between these variables is linear (see equation in pp. 5). In other words, having one day with 100 percent of shortage is equivalent to having two days with 50 percent of shortage in each day.

[9] Since the dependent variable in our model is in logarithms, to avoid the retransformation bias, we used the "smearing estimate" proposed in Duan, (1983).

Figure 6
Manufacturing Production
Index: Jan 2012 = 100
Seasonally Adjusted Series



Source: Authors' estimates with data from INEGI.

Table 2 shows the annual seasonally adjusted percentage changes in manufacturing GDP, estimated under the scenarios with and without shortages. We calculate the annual growth rate of the manufacturing sector for both scenarios and the difference between them. The most negative effect was observed in the second quarter of 2013. This result suggests that the manufacturing sector growth rate was approximately two-thirds of what it would have been in the absence of shortage.

Table 2
Impact of Natural Gas Shortages on Manufacturing Production
Annual Change

	2012-I	2012-II	2012-III	2012-IV	2013-I	2013-II
Manufacturing Sector						
Model with shortage (annual s.a. Δ%)	4.37	4.88	3.50	2.79	2.55	1.35
Model excluding shortage (annual s.a. Δ%)	4.37	4.95	3.67	3.08	2.76	2.27
Difference's shortage impact (pp)	0.00	-0.07	-0.17	-0.29	-0.21	-0.92

Source: Authors' estimates with data from INEGI.

Considering that manufacturing production is linked to other productive sectors,[10] like commerce and transportation, a negative shock on manufacturing indirectly affects the rest of the country's economic activity. Thus, to obtain the total impact on GDP we have to take into account the manufacturing multiplier effect.

In order to calculate this multiplier we estimate a model with eight sectors: mining, manufacturing, construction, electricity, commerce, transportation and communications, financial and other services. These sectors are linked in the model, and each sector is estimated with an equation. The main exogenous variables of the model are industrial production and GDP in the U.S., public investment, public consumption, interest rate, and real exchange rate for Mexico (see Appendix for details). We use an error correction specification because these variables are non-stationary. The model allows us to obtain second-round manufacturing effects and to estimate the elasticity of the Mexican GDP to changes in the manufacturing sector. We obtain an elasticity of manufactures with respect to the total GDP of 0.37, implying a manufacturing multiplier of 2.21.[11]

Table 3
Impact on the Mexican GDP
Growth Rate

	2012-I	2012-II	2012-III	2012-IV	2013-I	2013-II
Impact on GDP						
Total impact on GDP (pp on annual s.a. Δ%)[1/]	0.00	-0.03	-0.06	-0.11	-0.07	-0.34
Quarterly s.a. GDP growth rate (%)						
With shortage (observed)	0.67	1.67	0.10	0.78	0.20	-0.55
Excluding shortage (counterfactual)	0.67	1.69	0.13	0.82	0.17	-0.27

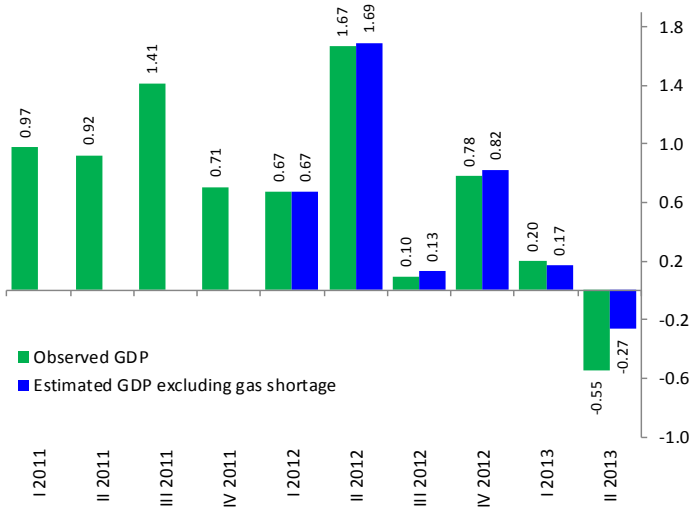
1/ the final effect on GDP was estimated using a manufactures multiplier of 2.21.

Source: Authors' estimates with data from INEGI.

[10] See WEF (2012).
[11] According to the Manufacturing Institute (2012), the manufacturing multiplier in the US is around 2.3.

We obtain the trajectory of the GDP with and without gas shortages using the estimated effects of gas shortages on the manufacturing sector and the elasticity of the GDP to changes in manufacturing. Table 3 and Figure 7 present the estimate of the impact of natural gas shortages on national economic activity. The most serious effect of the shortages on the GDP growth occurred during the second quarter of 2013, when the growth rate without shortages in seasonally adjusted quarterly terms, would have been -0.27 percent, rather than the observed -0.55 percent.[12]

Figure 7
Total GDP
Quarterly Percentage Change
Seasonally Adjusted Series



Source: INEGI and authors' estimates using data from INEGI.

[12] Note that in the first quarter of 2013 the growth with shortage is slightly higher that the growth without shortage. In this quarter shortages were not important. The fact that the X-12 seasonal adjustment procedure alters the growth path when there are changes in the original data could explain this observation. Yearly average growth, however, is higher in the scenario without shortages.

5. Conclusions

The Mexican economy suffered gas shortages from the first quarter of 2012 until the second quarter of 2013. In order to quantify the effect of these shortages on economic activity, we estimated a panel data model with month and state fixed effects. According to our preferred specification, an increase of 10 percentage points of shortage reduces manufacturing production by 0.32%. Shortages peaked during the second quarter of 2013, in this quarter the GDP growth rate in seasonally adjusted quarterly terms would have been 0.28 percentage points higher if shortages had not occurred. These results suggest that gas shortages are a factor that contributes to explain the poor economic performance of the Mexican economy observed in 2013.[13] It is important to note that this study does not capture medium and long term effects of gas shortages. There is circumstantial evidence that investors delayed or canceled productive projects in Mexico due to uncertainty about gas availability (El Informador, 2013).

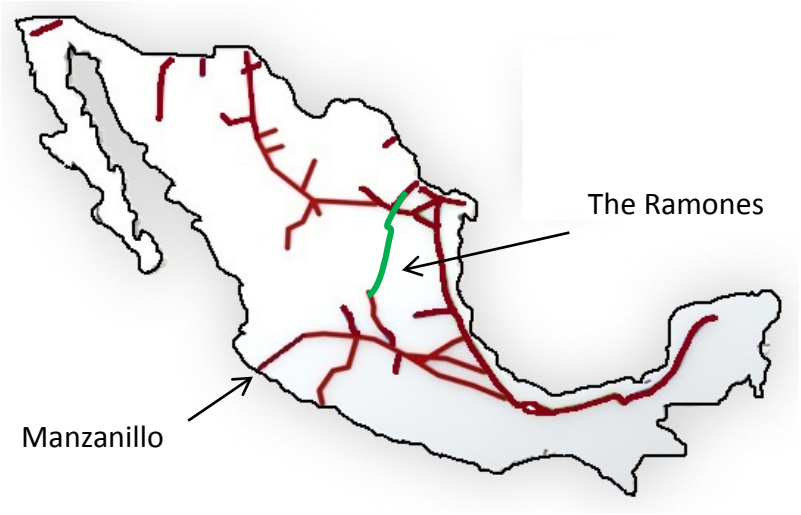
One of the main short-term measures used to address the problem of gas shortages was to import of liquefied natural gas by sea via Manzanillo, a western coastal city. However, the price is considerably higher, which could have also had an adverse impact on production, though not of the same magnitude as the one associated with the gas shortage. The Federal Electricity Commission was also affected by capacity restrictions in the pipeline infrastructure, which has raised the cost of electricity generation.

In the medium term, it will be necessary to expand the pipeline infrastructure. The new energy reform contemplates an ambitious program of investment in infrastructure with both public and private funding. “Los Ramones” project will both increase the natural gas provision to the mid-west region (see Figure 8) and contribute to the resolution of the “bottleneck” problem (*Secretaría de Energía*, 2013). It is crucial to advance this reform in order to reduce investors’ uncertainty as to whether the expansion of the pipeline network

[13] During the first quarter of 2013, after the relatively good year of 2012 in which the GDP grew by 3.6%, the average forecast for 2013 was 3.5% (see Latin American Consensus Forecast, April 2013). In the end, the growth in 2013 was only 1.06%.

will guarantee the timely supply of natural gas. Otherwise, investment in new productive projects could be discouraged.

Figure 8
National Gas Pipeline System
Proposed Scheme



Source: Presidency of Mexico, 2011

In addition, one of the factors that contributed to gas shortages was a price-setting mechanism that appears to underestimate the real price of natural gas. Thus, further research is needed to evaluate whether if the government should subsidize gas infrastructure or whether consumers should bear the burden. The energy reform is silent about the price-setting mechanism and the subsidy question. An informed and transparent decision regarding these points is crucial to avoid future shortages. Private investment in natural gas transportation infrastructure has been permitted since the 1995 reform, but there has been virtually no such investment. Therefore, opening the energy sector to private investment does not in itself guarantee efficient markets without shortages, if the price-setting mechanism is not correctly established.

These findings have important implications for economic policy for three reasons. First, they highlight the importance of a competitive and adaptable energy sector for economic growth in Mexico. Second, they contribute to a better understanding of the economic performance

of the Mexican economy in 2013. Third, they highlight the importance of the current energy reform and rise issues like the price-setting mechanism that could potentially hamper the development of industry.

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Appendix

Sectoral model.

In order to estimate the manufacturing sector second round effects we used an error correction model that includes a system of eight equations corresponding to eight economic sectors: 1) Mining, 2) Manufacturing, 3) Construction, 4) Water and Electricity, 5) Commerce, 6) Transportation and Storage, 7) Finance and 8) Communal, Social and Personal Services. Agriculture sector is excluded from the model. The total Mexican GDP is the sum of the nine sectors. The main exogenous variables of the model are public investment, public consumption, interest rate (CETES), real exchange rate, from United Sates: industrial production and GDP.

We perform a set of standardized tests to verify the observance of the assumptions of the Least Squares regressions. All equations pass the coefficient stability test CUSUM (cumulative sum control chart), CUSUM of square. In order to check for heterocedasticity, all equations pass the Breusch-Godfrey Serial Correlation Lagrange Multiplier Test and pass the Arch Hetercedasticity Test (both tests with four lags). Finally, all regressions have normal error distribution.

The most important sectors in the model are Commerce and Manufacturing. These variables also appear in the right hand side of other equations. This allows us to estimate the second round effects off the manufacturing sector on the economy.

In order to estimate the elasticity of the GDP to changes in the manufacturing sector we apply an exogenous positive shock to the manufacturing sector in the base scenario and we look at the changes on the GDP respect to the base scenario.

Effect of the Natural Gas Shortage on the Manufacturing Production

(US production index-state interactions included)

	Ln (manufacturing production)		
	(1)	(2)	(3)
Shortage $_{i\,t}$	-0.02	-0.03	-0.03
	(.01)	(.01)	(.01)
Trend $_t$		0.00	
		(.00)	
$ln(ipius_t)\,\pi_i$			
Aguascalientes	1.42	1.33	1.43
	(.02)	(.32)	(.03)
Baja California	1.10	1.01	1.10
	(.00)	(.33)	(.00)
Baja California Sur	-0.46	-0.55	-0.47
	(.00)	(.33)	(.00)
Campeche	0.21	0.12	0.21
	(.00)	(.33)	(.01)
Coahuila	2.21	2.12	2.21
	(.00)	(.33)	(.01)
Colima	0.86	0.78	(.00)
	(.00)	(.33)	(.00)
Chiapas	0.28	0.20	0.29
	(.00)	(.33)	(.01)
Chihuahua	1.42	1.34	1.42
	(.00)	(.33)	(.00)
Distrito Federal	-1.18	-1.27	-1.17
	0.02	0.32	0.03
Durango	(.22)	(.13)	(.22)
	0.00	0.33	0.00
Guanajuato	0.74	0.66	0.75
	(.02)	(.32)	(.03)
Guerrero	1.25	1.17	1.25
	(.00)	(.33)	(.00)
Hidalgo	1.02	0.94	1.04
	(.02)	(.32)	(.03)
Jalisco	1.21	1.13	1.22
	(.02)	(.32)	(.03)
México, Estado	1.36	1.28	1.38
	(.02)	(.32)	(.03)
Michoacán	-0.27	-0.35	-0.26
	(.02)	(.32)	(.03)
Morelos	2.83	2.74	2.82
	(.00)	(.33)	(.00)
Nayarit	0.68	0.60	0.68
	(.00)	(.33)	(.00)
Nuevo León	1.87	1.79	1.87
	(.00)	(.33)	(.01)
Oaxaca	0.36	0.28	0.37
	(.02)	(.32)	(.02)
Puebla	1.83	1.75	1.85
	(.02)	(.32)	(.03)
Querétaro	2.13	2.05	2.15
	(.02)	(.32)	(.03)
Quintana Roo	2.36	2.27	2.36
	(.00)	(.33)	(.00)
San Luis Potosí	2.75	2.66	2.76
	(.02)	(.32)	(.03)
Sinaloa	0.58	0.50	0.58
	(.00)	(.33)	(.00)
Sonora	1.63	1.55	1.63
	(.00)	(.33)	(.00)
Tabasco	1.49	1.40	1.49
	(.00)	(.33)	(.01)
Tamaulipas	-0.25	-0.33	-0.24
	(.01)	(.32)	(.01)
Tlaxcala	1.66	1.57	1.67
	(.02)	(.32)	(.03)
Veracruz	0.00	-0.09	0.00
	(.01)	(.32)	(.01)
Yucatán	-0.41	-0.50	-0.41
	(.00)	(.33)	(.00)
Zacatecas	-0.53	-0.62	-0.53
	(.00)	(.33)	(.00)
State fixed effects	✓	✓	✓
Monthly seasonal effects	✖	✖	✓
Cluster standard errors by state	✓	✓	✓
Number of observations	1,408	1,408	1,408
R-squared	0.826	0.826	0.827

Cluster robust standard errors by state in parentheses.