

NÚMERO 542

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## Do Consumers Really Prefer Formal Credit to Informal Credit? Evidence from a Pseudo- Experimental Design in Mexico

Importante

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## Abstract

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*The development of economic institutions characterizes economic growth and promotes efficiency. For example, formal credit institutions operate in the credit market in a more efficient way than informal money lenders because they are better in reducing costs associated with financial market operations. Formal credit institutions are desirable. Hence, it is important to analyze how agents choose between formal and informal credit markets. Using data from an intervention that affected the supply and the demand for formal credit in Mexico, we verify that agents transition from the informal to the formal credit markets when they are given access to the latter. In order to do so, we analyze empirical transition matrices and diff-in-diff estimators.*

*Keywords: formal and informal credit market, transition, persistence.*

## Resumen

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*El desarrollo de instituciones económicas caracteriza al crecimiento económico y promueve la eficiencia. Por ejemplo, las instituciones formales de crédito operan en el mercado con mayor eficiencia que las informales que prestan dinero porque las primeras son mejores en reducir los costos asociados a las operaciones del mercado financiero. Las instituciones formales de crédito son deseables. En consecuencia, es importante analizar cómo los agentes eligen entre mercados de crédito formales e informales. En este trabajo, verificamos que los agentes transitan del mercado informal al mercado formal de crédito cuando obtienen acceso a este último mercado y lo hacemos a través del análisis de datos obtenidos a partir de una intervención gubernamental que afectó la demanda y oferta del crédito formal en México. En nuestro análisis estudiamos matrices empíricas de transición y estimadores de diferencias en diferencias.*

*Palabras clave: mercado de crédito formal e informal, transición, persistencia.*

## *Introduction*

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Economic growth, measured as per-capita GDP, has an almost perfect correlation with consumption, life expectancy at birth, different human development indices, and other variables that characterize a developed economy (Acemoglu, 2009). One of the main hypothesis behind economic growth is that economic institutions explain a considerable portion of the differences in per-capita income across countries (Acemoglu, Johnson, and Robinson, 2005).

A credit institution, an example of these entities, is a formal supplier that, by the nature of its operation, processes and accumulates information about agents. It may be argued that it does so in a more efficient way than an informal money lender. Moreover, there is empirical evidence suggesting that in developing economies financial institutions are less efficient to those of developed economies (Demirguc-Kunt and Levine, 2001). Thus, the design and implementation of public policies that stimulate formal credit in developing economies should make this market more efficient. But, do consumers really prefer formal credit?

On the one hand, households may take informal credit simply because it is cheaper for them: their access to formality has a prohibitive price due to matters of distance, knowledge, or reputation. In this case, if they receive formal credit access they may transition from the informal to the formal credit markets whenever this is cheaper. We call this the transition hypothesis.<sup>1</sup> On the other hand, people may have a strict preference for informal credit: they may have a habit or a persistent preference for that kind of service. We call this the habit hypothesis. Our research question is straightforward: which hypothesis explains consumer behavior better? To answer it, we investigate how people transition from formal to informal credit markets after an intervention by the Mexican government that aims to increase the access to formal credit in the whole country.

Our results indicate that there is a significant increase in formal credit participation over time after formal credit access is widened. Put differently, the transition of the credit market participants evolves from the informal to the formal credit market as the government intervenes. We find this using data from a four year longitudinal survey done by Bansefi and Sagarpa, two Mexican agencies, to measure the impact of the Program to Strengthen the

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<sup>1</sup> If we observe transition from one market to the other by the same individuals we are able to conclude that the relative price of formal credit with respect to the informal decreased because individuals are utility maximizers. We disregard the hypothesis in which preferences change overtime, i.e., individuals prefer formal credit to informal in one period and the other way around in other period because in Economics literatura preferences are generally assumed to be static.

Popular Credit and Savings Sector (Programa de Fortalecimiento del Sector de Ahorro y Crédito Popular, PCSS).

The rest of the paper is structured as follows: Section 1 describes the data. Section 2 uses some “raw” data to shape some intuition about the transition and habit hypothesis and to describe some market relevant variables, while Section 3 describes the Empirical Strategy to estimate the effects of the intervention. Section 4 presents our results and, finally we set our conclusions.

## 1. Data

Since 2004 the Mexican government has run the PCSS. It has two main objectives: (a) stimulate savings among all the individuals in the population, as well as provide financial education as an instrument for financial inclusion; (b) strengthen the provision and distribution of non-banking governmental services.

In order to attain the first objective: (1) the clients that have a non-banking credit accounts with Bansefi are supported with at least \$13.00 USD (2009) and at most \$44.00 USD (2009) according to a savings scheme during the first year of the program for account holders or during the first year of membership for new account holders;<sup>2</sup> (2) the government completely covers a diagnosis of non-banking institutions in order to evaluate their profitability. It covers the elaboration and realization of a working program so that the non-banking institution can be registered in the National Banking and Securities Commission (CNBV). The government fully funds the registering process also. The maximum total expenditures that the government covers in this process is 70,000.00 USD (2009).

With respect to the second objective: (1) if a non-banking institution registers a new product and operates it for three months, it is granted a unique bonus of 435.00 USD (2009); (2) the receivers of remittances are granted \$8.70 (USD) at most twice a month and with a limit of \$210.00 (USD); (3) the non-banking institutions operating remittances receive \$4.35 per operation with a limit of \$8,696.00 per fiscal year.

In order to evaluate the program, Bansefi and Sagarpa collected the Survey of Savings, Popular Credit and Rural Micro-Finances which had a baseline in 2004 and follow-ups in 2005, 2006, and 2007.<sup>3</sup>

The sampling method to do so was the following: first, the population was divided into households in which at least one person had a formal credit

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<sup>2</sup> This policy aims to persuade the agents to change from Savings Banks to Banse.. The latter institution provides services that are similar to the ones offered in the banking sector.

<sup>3</sup> All the data analyzed in this paper comes from this survey, and can be found in: <http://www.banse.gob.mx/SECTAHORROCREDDPOP/INVESTIGACIONESSACP/Paginas/Estudiosproybancaizacion.aspx>.

account from any institution and the rest of the households that did not. Then, a random sample from the first kind of households was taken and labeled treatment group. Finally, a random sample of households which had no formal credit at all was constructed and named control group.

**TABLE 1. SAMPLE SIZES AND ATTRITION**

	[1]	[2]	[3]	[4]	[5]	[6]	[7]
	N				NON-ATTRITED RATES		
	2004	2005	2006	2007	[2]/[1]	[3]/[1]	[4]/[1]
Total Sample	5,719	4,467	3,649	3,473	.7810	.6380	.6072
Treatment Subsample	2,926	2,440	2,058	1,873	.8114	.6869	.6251
Control Subsample	2,793	2,027	1,591	1,600	.7257	.5696	.5728

The baseline consisted of 5,719 households, 2,926 in the treatment group and 2,793 in the control. In 2007, the last round of the survey, 3,473 households were re-contacted, 1,873 in the treatment group and 1,600 in the control. Woodruff and Martinez (2008) extensively analyze the data by year, describing household characteristics, attrition rates and their probable reasons, etc. After running the usual tests, the authors find that, when controlling for the entire characteristics of the households, attrition has no impact in the penetrations rates of credit, measured by the probability of a household having credit. Attrition was not a problem in this survey.

**TABLE 2. SAMPLE COMPOSITION BY SOCIOECONOMIC LEVEL**

SOCIOECONOMIC LEVEL	2004			2007		
	TREATMENT	CONTROL	TOTAL	TREATMENT	CONTROL	TOTAL
Very Low	629	427	1,056	344	308	652
Low	893	946	1,839	431	457	888
Medium	565	532	1,097	366	287	653
High	751	708	1,459	809	671	1,480
Very High	46	37	83	10	3	13

Now, the characteristics of the data design lead us to think of an intervention or "treatment": on the one hand, the treatment group is composed by households that, when the baseline survey was conducted, already had encountered the way to access formal credits. On the other hand, the control group was built among households which had not encountered that service.

Then, we thought of the basic Program Evaluation framework to assess the treatment effect on the control group.<sup>4</sup>

We are not saying that the data has an experimental design: households were not assigned randomly to a program, but filtered through a previous condition (having formal credit in 2004). However, we can think of the intervention's prior aim as trying to have an effect in the credit status of the control group households because, prior to 2004, they had not encountered access to the formal credit market. We refer to this design as "pseudo-experimental": the control and treatment groups were first separated by their credit status and then randomly sampled, as explained above.

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<sup>4</sup> In terms of the standard Program Evaluation literature the terms treatment and control would be flipped because the control group in this case is the one "receiving" the intervention by easier access to non-banking governmental institutions (although for the treatment this was made easier too, they already had the access). We keep the names assigned by the survey designers.



**TABLE 3. SOCIOECONOMIC CHARACTERISTICS OF HOUSEHOLDS IN 2004**

	MEAN (CONT)	N (CONT)	MEAN (TREAT)	N (TREAT)	MEAN DIFF	S.E.	P-VALUE
HH Heads Avg. Age	44.556	2790	46.685	2924	-2.130	0.399	.000
Female Head Works=1	0.225	2793	0.324	2926	-0.099	0.012	.000
Indigenous Language-1	0.216	2793	0.251	2926	-0.035	0.011	.002
Educ. Group 1	0.255	2793	0.224	2926	0.031	0.011	.005
Educ. Group 2	0.220	2793	0.187	2926	0.033	0.011	.002
Educ. Group 3	0.079	2793	0.143	2926	-0.064	0.008	.000
Educ. Group 4	0.0275	2793	0.143	2926	-0.116	0.007	.000
Rec. Remms=1	0.0347	2793	0.042	2926	-0.008	0.005	.118
Own Land=1	0.168	2793	0.244	2926	-0.076	0.011	.000
Own House=1	0.685	2793	0.828	2926	-0.143	0.011	.000
Number of Rooms in HH	2.753	2793	3.690	2926	-0.937	0.042	.000
Piped Water=1	0.864	2793	0.906	2926	-0.042	0.008	.000
Own Agr. Biz	0.204	2793	0.280	2926	-0.076	0.011	.000
Avg. Ann. Int. Rate	0.499	66	0.308	697	0.192	0.026	.000

Had the households in the treatment group in 2004 been statistically equal in mean observable characteristics to the ones in the control group, we would have been able to use mean-based estimators to assess the average treatment effect of the intervention, interpreting the intervention as described above (i.e., considering the “pseudo-experimental design of our data”). However, Tables 2 and 3 show that the two samples differ in observable characteristics. Then, we make use of a basic matching estimator to control for the initial differences between the treatment and control groups. We develop this further in Section 3.

## 2. Transition

Before explaining our estimation techniques we want to understand how agents transition from the informal to the formal credit markets using an empirical strategy by analyzing the raw data. Our data has information of the 3 major credits that a household had in each of the observed years. We classify the credit of the individuals into four possible states: no credit, formal credit, informal credit or both. Then, we construct empirical transition matrices from 2004 to 2007.<sup>5</sup>

TABLE 4. TRANSITION MATRIX 2004-2007, ALL THE SAMPLE

		2007				
		NON	FORMAL	BOTH	INFORMAL	TOTAL
2004	Non	.7323	.1237	.1421	.0018	1
	Formal	.4434	.4048	.1508	.0010	1
	Both	.5191	.1872	.2861	.0076	1
	Informal	.3824	.1471	.4559	.0147	1

Table 4 shows the matrix for the whole sample. First, note that the people that had no credit in 2004 seem to stay persistently in that status in 2007. It is difficult to say anything more than the households that were unable to have credit in 2004 are, in the majority of the cases, unable to have one in 2007. This may simply be due to a budgetary constraint. Even when the program affects the access, it does not affect how individuals are constrained with respect to their total income.

<sup>5</sup> The fact that we have households with credit in the control group when constructing the empirical transition matrices may look rare because of how the data was constructed. However, the control and treatments groups were sampled according to Bansefi and Sagarpa listings about credit status. Once the surveyers arrived to the control households 90 reported that they had a formal credit.

The households that have formal credit in 2004 transition, mostly, to no credit and formal credit in 2007. Their probability of transition to informal credit by having both kinds of credits or just informal is low with respect to the transition to the other two states. We are not able to disentangle why people have up to a .443 probability of transition to no credit, but we are able to say that there is persistence in the formal credit market, up to a .404 probability.

The ones that had both credits does not transition very often to only informal credit. Their probability of transition to only formal credit is relatively higher than the one of the just informal credit in 2004, which is a remarkable fact.

Lastly, we look at the households that just had informal credits in 2004. They have a relatively low probability of having no credit in 2007 and a relatively high probability of having both credits in 2007, if compared to the households that had formal credit in 2004. A plausible story about this fact is that agents substitute informal credit for the formal one. This story is reinforced by noting that the transition from informal credit in 2004 to the same type of credit in 2007 is very low.

The transition to the informal sector is low from every state in 2004. This, again, supports the transition hypothesis: in 2004 the formal credit access was widened and the probability of transition from informal credit in 2004 to informal credit in 2007 is very low. Also, we have to say that the probability of having both an informal and a formal credit in 2007 is considerable with respect to the rest of the states in every state in 2004. Even when households do not seem to transition to only informal credit, they do use both kinds of services.

**TABLE 5. TRANSITION MATRIX 2004-2007, TREATMENT GROUP**

		2007				
		NON	FORMAL	BOTH	INFORMAL	TOTAL
2004	Non	.6937	.1745	.1311	.0006	1
	Formal	.4304	.4293	.1403	.0000	1
	Both	.4602	.2706	.2630	.0062	1
	Informal	.2632	.2105	.4737	.0526	1

Table 5 and 6 show the same matrices as before. However, now we separate the sample in treatment and control groups. The disaggregation of the data does not seem to impact our previous conclusions qualitatively. However, note that transition from the informal market in 2004 to the informal market in 2007 for the control group has 0 empirical probability. This is an important

feature of the data due to how the control group is built: it is the group that had no formal credit in the baseline.

**TABLE 6. TRANSITION MATRIX 2004-2007, CONTROL GROUP**

		2007				
		NON	FORMAL	BOTH	INFORMAL	TOTAL
2004	Non	.7675	.0774	.1522	.0029	1
	Formal	.5138	.2722	.2080	.0061	1
	Both	.5794	.1018	.3097	.0091	1
	Informal	.4286	.1224	.4490	.0000	1

Tables 4, 5, and 6 seem to support the transition from the informal to the formal credit markets hypothesis. The households transition from the informal to not having, having formal and having both, but do not persist in the informal credit market. Actually, there is no evidence either to say that they persist as having both formal and informal credits.

These matrices help us shape some intuition about how to answer our research question with respect to the households' behavior. Nonetheless, there are at least two other market variables that are also affected by the intervention: the number of suppliers and the prices paid for acquiring credits.

Unfortunately, we do not have dynamic data on the number of suppliers. The only data we have about supply is summarized in Table 7.

**TABLE 7. FORMAL CREDIT INSTITUTIONS IN 2010, BY SOCIOECONOMIC LEVEL**

SOCIOECONOMIC LEVEL	NON-BANKING	BANKING	TOTAL
Very Low	1,915	1,048	2,963
Low	1,082	1,078	408
Medium	476	386	862
High	287	121	408
Very High	4	3	7

Table 8 contains information about prices. In general the prices paid by the control group are greater than those paid by the treatment group. This is expected because control households are the ones that initially have no formal credits. All the socioeconomic levels of the sample, except the very low, paid less interests in 2004 than in 2007 for their credits. We have no data

to assess if this decrease is only due to the intervention we are studying. However, the decrease is worth noting.<sup>6</sup>

**TABLE 8. AVERAGE ANNUAL INTEREST RATES PAID ON CREDIT BY SOCIOECONOMIC LEVEL**

SOCIOECONOMIC LEVEL	VERY LOW	LOW	MEDIUM	HIGH	VERY HIGH
<b>TREATMENT GROUP</b>					
2004	.2750	.2780	.2873	.3896	N/A
2005	.2401	.2529	.2975	.2822	N/A
2006	.2683	.2518	.3009	.3435	N/A
2007	.3030	.2670	.2481	.2487	N/A
<b>CONTROL GROUP</b>					
2004	.3878	.3793	.4020	.5689	N/A
2005	.2011	.2990	.2356	.3326	N/A
2006	.2483	.3819	.3220	.3545	N/A
2007	.3555	.2626	.3010	.2743	N/A

### *3. Empirical Strategy*

As explained above, we think of the intervention as having a “pseudo-experimental” design. We want to obtain the average treatment effect (ATE) of the intervention in the credit status of the individuals. We acknowledge that the intervention was not assigned randomly. However, we do think that a diff-in-diff approach is helpful to shed light on the transition of the individuals between the formal and informal credit markets.

Since the principal objective of the intervention is to “formalize” the credit market, its main aim is to affect the credit status of the control group. Hence, an estimation of this nature approximates at least some portion of the effect that the intervention has. In a longitudinal design, the diff-in-diff estimator  $\Delta_{k,t}$  subtracts the difference in year  $k$  dependent variable’s mean from to the baseline year dependent variable’s mean of the treatment group from the same difference for the control group. If the outcome of interest is dichotomic, it approximates the change in the probability of having an outcome equal to 1. For example, if the outcome is “formal credit”, the  $\Delta_{k,t}$  is the change in the likelihood of having formal credit due to the intervention, compared to not having formal credit.

In Table 3 we see that the treatment and control groups are not balanced in observable characteristics. Then, we use an inverse probability weighting

<sup>6</sup> Note that Table 3 also establishes a significant difference between the interests paid in each of the groups.

scheme (IPW),<sup>7</sup> to estimate the average treatment in the not treated (ATNT) in the following model:<sup>8</sup>

$$c_{it} = \beta_1 + \tau_i + \beta_2 v_{2,it} + \beta_3 v_{3,it} + \beta_4 v_{4,it} + \Delta_2 v_{2,it} \cdot t_1 + \Delta_3 v_{3,it} \cdot t_1 + \Delta_4 v_{4,it} \cdot t_1 + z_{it} \delta + \varepsilon_{it} \quad (1)$$

where  $\tau_i$  is a household fixed effect;  $v_{k,it}$  is a time dummy variable for the surveyed periods 2005, 2006, and 2007, indexed by 2, 3, 4 to index the baseline as 1;  $t_1$  is a dummy variable indicating if the household is in the treatment group;  $z_{it}$  is a vector of household observable characteristics; and  $\varepsilon_{it}$  is a random term. Finally,  $c_{it}$  is a dummy variable indicating credit status: Since we observe four different credit states (no credit, formal credit, informal credit, both credits), we create four different outcome dummies and estimate four different models. The sub-indices of the variables are as usual:  $i$  indexes household and  $t$  indexes time.

By the construction of the dependent variables,  $\Delta_k$  is an estimate of the change across groups in the likelihood of having a “=1 outcome” from the baseline to year  $k$ .<sup>9</sup> For example, if the intervention was to work, the change in the likelihood would be greater for the control group in the case where formal credit is the dependent variable. Thus,  $\Delta_k$  would be negative.

#### 4. Results

Table 9 shows our results. The No Credit column shows that the intervention has a significant, negative effect in the likelihood of having no credit; it is effective in increasing the likelihood of having credit. The effect is non-monotonic over the years and ranges from a 8.0% decrease in the likelihood of not having credit from the baseline to 2005 to a decrease of 10.2% in the case of 2007.<sup>10</sup>

The Formal Credit column shows that the likelihood of having formal credit increases significantly 8.5%, 12.8%, and 10.6% the likelihood of having formal credit in 2005, 2006, and 2007 if compared with the baseline. In this case, the effect is also non-monotonic. With respect to the Both Credits column we can say that there are no significant findings: the intervention

<sup>7</sup> We calculate the probability of being in the treatment group based on an extensive list of observables found in our data. Then, we weight the individuals using the IPW approach. For a detailed discussion about this method see Angrist and Pischke (2009).

<sup>8</sup> Recall that we are interested in the non-treated because in this case the control group is in the one that actually receives the treatment.

<sup>9</sup> Note that this follows from the fact that the dependent variable is a dummy.

<sup>10</sup> Note that the signs of the estimations appear to be flipped because of the way in which the treatment and control groups are defined: the intervention targets the control group.

does not appear to significantly affect the likelihood of having both kinds of credits.

**TABLE 9. IPW ATNT DIFF-IN-DIFF ESTIMATIONS<sup>11</sup>**

DEPENDENT VARIABLE	MEAN (CONT)	N (CONT)	MEAN (TREAT)	N (TREAT)
Round 2005(2) dummy	.109*** (.041)	.081*** (.025)	-.0172*** (.043)	-.018* (.010)
Round 2006(3) dummy	.116*** (.042)	.071*** (.025)	-.223*** (.043)	-.015 (.010)
Round 2007(4) dummy	.078* (.042)	.115*** (.025)	-.182*** (.043)	-.011 (.010)
Round 2005*Treatment	.080**	-.085***	-.007	.012***
$\Delta_2$	(.022)	(.016)	(.021)	(.004)
Round 2006*Treatment	.102***	-.128***	.018	.007*
$\Delta_3$	(.023)	(.017)	(.022)	(.004)
Round 2007*Treatment	.070***	-.106***	.032	.005
$\Delta_4$	(.023)	(.019)	(.022)	(.005)
Household Heads Avg. Age	.002* (.001)	-.001 (.001)	-.001 (.001)	.000 (.000)
Female Head Works=1	-.048** (.015)	.021 (.012)	.026** (.014)	.001 (.003)
Number of Rooms in HH	-.002 (.004)	-.004 (.003)	.003 (.004)	-.001* (.001)
Own Agr. Biz	-.048* (.024)	-.004 (.018)	.053*** (.022)	-.001 (.004)
$R^2$	.060	.014	.062	.007
Adjusted $R^2$	.059	.013	.061	.006
N	17,208	17,208	17,208	17,208
Number of Clusters	5,709	5,709	5,709	5,709

Note: Robust Standard Errors In Parenthesis (Clustered By Individuals). \*\*\*P < .01; \*\*P < .05; \*P < .1

Finally, the Informal Credit column shows that the likelihood of belonging to the informal credit market monotonically decreases as the intervention goes by, it diminishes 1.2%, 0.7%, and 0.5% in 2005, 2006, 2007 respectively when

<sup>11</sup> Other non-significant in any case covariates included in the regressions are education dummies, received remittances, land ownership, house ownership, and piped water.

compared to the baseline, although the last two are not significant at a reasonable confidence level.

The estimation results point in the same direction that the “raw” evidence presented in Section 2: the pseudo-experiment that we analyze supports the transition hypothesis. There is a positive, significant and increasing overtime effect of providing non-banking governmental institutional credit infrastructure in the choice of households between the formal and the informal credit markets. Also, there is a negative impact on the probability of not having credit.



## *Conclusions*

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The main reason for the government's pursuit of economic institutions development should be that this is said to be one of the major factors determining economic growth. One example of this pursuit is an intervention carried on by the Mexican government that tries to widen the access to formal credit. Using pseudo-experimental designed data spanned from this intervention, we assess how households transition between the formal and informal credit markets. We do so by constructing empirical transition probabilities from one market to another and analyzing differences-in-differences estimates used in Program Evaluation literature.

Our evidence suggests that the intervention was fruitful. When the households were granted access to the formal credit market, their likelihood to become formal credit market participants considerably increased through the years that we study. Moreover, their likelihood of acquiring informal credits monotonically decreased, while their overall likelihood of not having a credit decreased.

Even when we are cautious in the interpretation of our results because the experimental design we use has failures and because causality is a difficult question to address, we have collected evidence to say that transition between formal and informal credit markets is much more evident than habit formation.

We did not find literature with respect to this topic using Micro or Macro data. This paper seems to be a good starting point. In order to provide a better answer to our research question, we either need data from a better experimental design or build a theoretical model of how agents transition from the informal to the formal credit markets and do some calibration exercises to contrast them with our current findings. This is our research agenda for the future with respect to this topic.

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## Novedades

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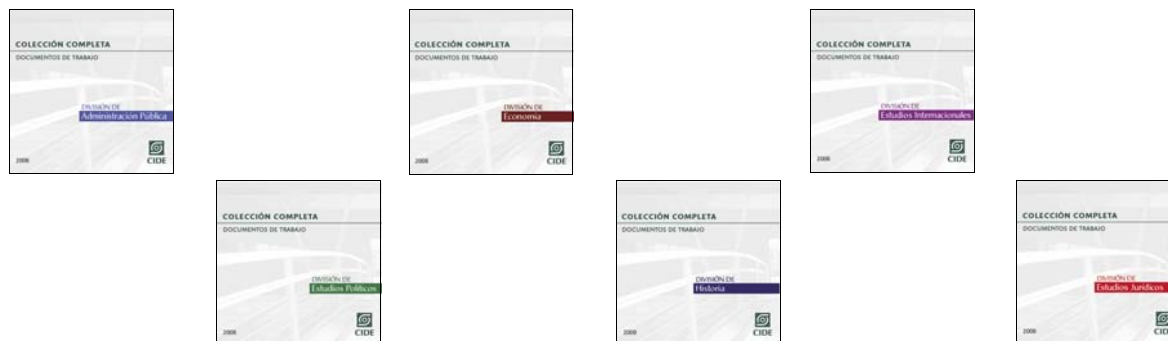
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